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COMPUTER WEEKLY

Pioneer of computing tells of Turing's four missing versions

SPEAKING on home ground to an audience which included Prof M. V. Wilkes, Dr T. H. Flowers and "Doc" Coombes, Dr James Wilkinson delivered the fifth in the series of "Pioneers of Computing" lectures at the National Physical Laboratory last week.

Still a member of the Division of Numerical and Applied Computing, Dr Wilkinson joined NPL in May 1946 and immediately started work on what was to become Pilot Ace, one of Britain's earliest computers.

His time was initially divided 50/50 between working with Charles Goodwin and Leslie Fox in the Mathematics Division, and with Alan Turing who was then the only member of the high-speed computing section.

It had been accepted that a computer would be built, and when Wilkinson arrived at NPL he found Turing working on the logical design of a machine which he called Version 5. According to Wilkinson, Turing was the worst of documentors and there was no trace of Versions 1 to 4.

However Turing had made up his mind about several things, including the fact that the machine would have a main memory of 8K words in the form of 200 mercury delay lines, each of which would store 32 words of 32 bits. These were referred to as "long tanks", while a number of temporary stores were referred to as "short tanks". The machine was to work at a megacycle pulse repetition rate and input/output was to be by punched cards.

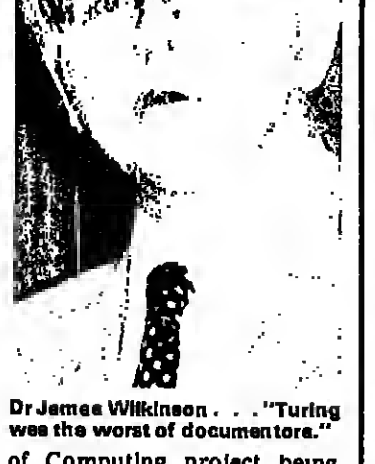
Nevertheless this machine was not to see the light of day, nor were six and seven, and in 1947 Turing, who had had disagreements with various people at NPL, left for a year's sabbatical at Cambridge.

It was not until work on a small machine known as the "Test Assembly" had been completed that a start was made on Pilot Ace late in 1948.

For much of 1949, which he described as "a most exciting but also arduous time" Wilkinson was heavily involved in wiring up the chassis as they were completed, and in debugging the computer which first worked on May 10, 1950. Despite "not having a terribly coherent philosophy behind it" Pilot Ace proved to be a more powerful machine than Wilkinson had at first imagined, largely because of its excellent facilities for floating point arithmetic.

In fact English Electric then became interested in Pilot Ace and subsequently produced an engineered version known as Deuce, over 30 of which were sold in the commercial market.

Dr Wilkinson's lecture was delivered as part of the History of Computing project being undertaken by NPL in collaboration with the Science Museum. Cassettes containing the lectures and reminiscences of computer pioneers are being produced as part of the project, and the first set can already be obtained from the Science Museum.



Dr James Wilkinson . . . "Turing was the worst of documentors."

PO group to advise on X25 interface

A STUDY group has been formed by the Post Office to define customer interface requirements for attaching terminals to packet-switched networks using the international X25 standard interface.

The group will meet under the chairmanship of Pat Morrison, who is in charge of marketing packet-switched services at the Post Office.

It will have eight representatives of research and educational establishments, five from hardware manufacturers, one government representative, one representative from the software industry and six Post Office members.

Names of participants have yet to be announced.

The Post Office has not yet decided to replace the Experimental Packet Switched Service, EPSS, with a permanent network, but any future network would conform to X25.

The work of the group will contribute towards the planned Post Office guide to attachment to X25 networks, such as the EEC's Euronet.

Readers wanting copies of the drafts, due in the first half of next year, should contact New Data Services, Data Communications Division, Post Office Telecommunications, Freepost, London EC2B 2TX.

Microwave order

MICROWAVE communication between France and Switzerland is to be enhanced with the use of 6 GHz broad band transmission equipment to be supplied by GEC Telecommunications of Coventry.

ICL fills gap in delayed VME/B enhancements

TO overcome some of the delays in producing promised enhancements to the VME/B 2900 operating system, ICL is planning to put out an interim release, SV 22.5 next month.

However, the major VME/B release, designated SV23, which was expected about now according to one large 2900 user, is not likely to be introduced before next April. The user said this was due largely to snags with SV21, which was released earlier this year (CW, February 24).

Most significant of the SV22.5 enhancements will be a new version of the standard 2900 database management system, IDMS. ICL sources have said that this will be the first "recommended" release of the DBMS, suggesting shortcomings in previous versions.

Another feature of SV22.5 will be an update to the Fortran compiler. The relative urgency of this, compared to Cobol, is probably a reflection of the large proportion of universities among early VME/B users.

The interim release will also include an enhanced version of ICL's Data Management Utility System, but user comment was unenthusiastic. "DMUS includes much the same kind of facilities as the National Computing Centre's Filetab," said one, "and the NCC is already producing a 2900 Filetab."

He thought the DMUS enhancements could be a delayed feature of SV22 rather than an advance on SV23.

This state of uncertainty on specific points reflects a general situation with VME/B. Even users find it difficult to get advance information on what facilities will be released and when.

Next year's SV23 release will include the first official release of dual processor software for the 2970, though some users have already implemented dual processor configurations. There will also be some emphasis on recover, with improvements in file recovery capability, and checkpoint-restart for the Cobol compiler.

ICL's internal batches of enhancements do not correspond rigidly with external releases, but SV23 will implement most of the enhancements contained in the internal 5X27 release.

The recovery aids in SV23 reflect this, as does a planned "whoosh loader," allowing the machine to be reloaded in "one to two minutes" in the event of a failure. ICL is aiming to reduce both mean time between failure and mean time to repair in VME/B.

GA regroups in Europe

THE European operations of General Automation have been restructured with the aim of providing a more homogeneous service, particularly to GA's major multinational companies (CW, September 15).

The decision to reorganise was taken a year ago and, in February, all sales forces except that of the UK were combined under Pedro Weinreb, who moved up from area sales manager for France, Italy, Scandinavia and Benelux to European sales director.

European marketing falls to Norman Chisman, who has moved to the new European headquarters at Aachen on West Germany's border with Belgium. Chisman was previously UK director of systems, and both he and Weinreb report to Walfrid Mildner, Vice-president Europe, who was formerly managing director of the West German operation, which also took in Australia and Switzerland.

The UK was to have been brought into the regrouped structure at some indefinite date, but during the summer it was decided to bring this forward. Accordingly on August 1 John Newman, managing director of the UK company and also in charge of Spanish operations, took over management of engineering, research and development, procurement and shipping. The UK sales force also reported to Weinreb from that date.

Newman has now decided to leave General Automation for a post with Kode International.

"I am sorry to be leaving General Automation, but Kode made me an irresistible offer. I think the GA restructuring is a good move: it will enable the company to liaise more effectively with major multinational customers.

DoI plan to aid small companies' automation

A SUPPORT scheme which will help small manufacturing companies examine the viability of improving their efficiency by using computers in production management, has been introduced by the Department of Industry. The scheme is expected to encourage the growth of expertise in computer aided production management among consultancies.

Under the scheme manufacturing companies with up to about 500 staff will be able to get up to £2,000 from the government to pay for a feasibility study carried out by a consultancy which is not connected with a computer manufacturer or with the client company. The consultancy pays back the money to the government if subsequently asked to install a computer system for the client.

The scheme is to run for three years and between £300,000 and £400,000 has been earmarked for payments to consultancies.

The scheme is being run and monitored by the Blacknest Production Control Group, a group of four engineers formed five years ago by the Atomic Weapons Research Establishment at Aldermaston.

It is expected that the manufacturing companies will be identified by the consultancies and that the two will make a joint approach to the Blacknest group.

Government statistics show that there are about [illegible] manufacturing firms which could take advantage of the scheme.

Companies wishing to take advantage of the scheme should contact the secretary, Production Control Group, Blacknest Centre, Brimpton, Near Reading, Berkshire RG7 [illegible]. Telephone 07356-4111, extension 5951.

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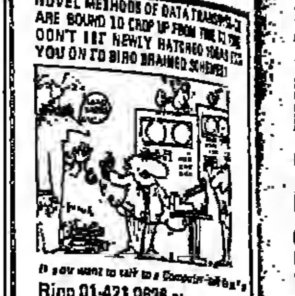

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IBM 3032, 3031 next week

THE IBM 3032 and 3031 are expected to be announced next week. The 3032 is likely to cost about £1.7 million and offers 50 to 80% more power than a 370/168, while the 3031 is expected to cost about £800,000. First deliveries to customers are believed to be scheduled for late 1978.

Typical equivalent 370/158 and 148 prices are £1.2 million and £500,000 respectively.

BCS fees dispute

MEMBERS of the British Computer Society have been called to action to vote against two motions at the annual meeting. The motions, which propose a non-returnable membership application fee of £5 and a joining fee of up to £50, could have a profound effect on the BCS's future, says BCS member David Allan in a letter to Computer Weekly. Letters: page 12.

Privacy guidelines

RECOMMENDATIONS on legislation protecting personal data stored in computer systems will be published this week by the British Computer Society, the Computing Services Association and the Data Processing Management Association. The three bodies got together to work out guidelines for the government's Data Protection Committee. Report on the OECD Transborder Data Flow Conference; back page.

Kode chief

JOHN NEWMAN, who has resigned as managing director of General Automation to join Kode International (CW, September 22), is to take up the newly-created post of group executive in charge of Kode's capital equipment operations. These comprise Kode Ltd and Kode Services, the two firms that handle manufacturing, marketing and servicing of Kode data entry and terminal equipment.

Spurned offer

THE anonymous offer to donate an IBM System 3 to the Labour Party about two years ago, is now believed to have come from Sir Eric Miller, the Peachey property tycoon who was found shot dead last week. The offer was not taken up; and the party now has an ICL 2903/20 system.

Philips' launch

A FURTHER addition to the Philips line of workstation-oriented business computers is to be announced in Germany shortly. Called the P430, it will slot between the P410, announced last year, and the P440, launched at Hanover in April.

Showpiece

STAR attraction at this week's Racalex exhibition of Racal products at the Royal Lancaster Hotel is a network management system based on the Intel 8080 and designed to maximise network uptime. Racal-Milgo says that for a network of 20 or more modems, the System 180 Network Diagnostic Controller costs an additional 20% over the price of the modems.

A major attraction at Sicob was the Micral V computer in a suitcase from microprocessor systems specialist R2E. It will run off 12 or 24 volt car batteries.

Left-wing cloud over Sicob

TIM PALMER REPORTS FROM PARIS

THE microprocessor vied with French politics as the main talking point at the 1977 Sicob exhibition in Paris, which closes tomorrow (September 30).

On the microprocessor front, the Intel 8080 and its software-compatible rival, the Zilog Z80, turned up in almost all the new equipment exhibited at the show, including the NCR 8100 office computers, R2E's Micral V computer in a suitcase, and the new Logabax LX1000 terminals and LX2000 VRCs.

On the political front, the opening of the show by Prime Minister Raymond Barre was overshadowed by the machinations of the "Left Alliance" of Socialists and Communists. During the show, they announced the companies they intend to nationalise, including CII-HB, Thomson, CGE and ITT — then promptly broke up in disarray, having failed to agree on the rest of a common programme.

The question everyone was asking was why IBM was not included on their shopping list.

NCR chose Sicob to unveil its new 8100 line of office computers, which has not yet even been announced in the US. The 8130 is an office computer running Cobol programs under an operating system compatible with the rest of the 8000 line, and the basic configuration includes 48-64Kbytes of memory, display, two or four floppy drives and a built-in printer.

The 8150 uses the same

● Turn to page 2

Citibank's New World

THE minicomputer revolution at Citibank has arrived in the UK with a programme to replace the IBM 370/135 mainframe at Citibank Financial Trust with a network based on twin Data General Nova 3D minicomputers.

The system, called New World, is being designed and specified by systems house Data Logic. It will give direct access from 60 offices throughout the UK to files to be built up on three 92K-byte disc drives attached to each of the Novas.

Citibank Financial Trust offers a full banking service both to individuals and companies, including mortgages, hire purchase, personal loans and leasing.

Each office will be equipped with at least one intelligent display terminal and printer developed specifically for the application by Megadata.

Data Logic has developed a technique for fast record access from disc. Called Direct Access with Rollover, it is designed to make economic use of main memory. Data Logic has also had to design hierarchical access methods giving the system a high level of security.

Citibank is spending about £660,000 on the system, to be implemented in two stages.

Exxon joins the battle of giants

From Becky Barns in Washington and Keith Jones in London

THE latest contender for a share of the potentially enormous market for electronic office equipment is the worldwide oil corporation, Exxon, which is soon to introduce a low-cost text editor to compete directly with IBM's memory typewriters.

Exxon, better known in Europe as Esso, is also weighing in against Xerox, and AT&T, the US telecommunications giant, for a share of this market.

The text editor, called the QYX, is being built by Qix of Lionville, Pennsylvania, a firm set up by Exxon Enterprises, a venture capital organisation established by Exxon as part of its long-term diversification plans.

Exxon Enterprises already has major shares in about 10 computer equipment companies, including Qume and Zilog, which are supplying the daisy wheel printers and microprocessors around which QYX machines are configured.

Industry sources indicate that the QYX will sell for between £900 and £2,000 which will make it considerably cheaper than any existing word processing system.

The QYX will complement the word processing systems manufactured by an existing Exxon Enterprises affiliate, the Vydec Corp of New Jersey. This manufactures the Editor system which comes with a full page VDU, floppy disc storage, optical character reading and communications facilities.

It is not clear yet if Vydec will sell the QYX in the US or Europe. But representatives of Vydec's subsidiaries and agents in Europe are meeting in Paris this week to discuss the possibility of selling it over here.

Meanwhile, US sources indicate that Exxon Enterprises is considering the acquisition of a division of Xerox to supply the essential end user marketing force.

The range of electronic office equipment from Exxon is made even more complete by the facsimile transmission kit built by another Exxon Enterprises affiliate, Qulp.

NEW THIS WEEK Futureview

Turn to page 18 and you can partake in a unique experiment that aims to give an insight into likely developments in computer technology and their impact on society.

Dr Christopher Evans has devised a Delphic poll which contains 21 statements about future developments. All you have to do is to tick a box for each question which most closely correlates to the time you think the development will reach fruition.

The collective views of Computer Weekly will help to provide a map of our computer future.

This poll is the start of a new CW series, called Futureview, which will provide a platform in which science fiction writers, technologists, sociologists, etc can focus our eyes on tomorrow's computer world.

Turn to page 18

Fortran processor from Burroughs

AS a follow-up to its Fortran-oriented "supercomputer", the Scientific Processor (CW, April 14), Burroughs has developed a modified version with a reduced, but still impressive, Fortran performance, aimed at a wider market.

Known as the Attached Fortran Processor it is, like the Burroughs Scientific Processor, designed to work as a "back end" to a general-purpose Burroughs machine. The AFP can be attached to the B6700, 6800, 7700 or 7800 and is expected to be announced in the UK within a few weeks.

The processor has a speed of 1.5 million floating-point operations per second (Mflops). This compares with the 50 Mflops speed of the BSP, but is still faster than most general purpose machines. The price ranges from $850,000 to $2.8 million, depending on memory.

The target market, explained a spokesman at Burroughs' Detroit office, was the user with some commercial processing, but frequent problems of the "number crunching" type.

£2.4m order

THE Littlewoods Organisation, which is one of Honeywell's biggest Level 66 mainframe users with £10 million-worth at its head office, has ordered 42 Level 6 minis worth £2.4 million. They will handle remote applications including printing, data entry and satellite processing within end user departments.

COMPUTER WEEKLY'S INSIDE NEWS

Michie on Dijkstra
Professor Donald Michie gives his Privateview on Professor Dijkstra's micro attack; and Iann Barron, who chaired the now notorious IFIP session at which Dijkstra spoke, comments in our Letters page. Pages 4 and 12

George 2 rules
Op Spot looks in praise at George 2 Page 5

JCL OK
Programmer notes on Job Control Languages Page 7

Adam's Whistle
Adam the computer joins an amazing competition, which includes all-male whistling, but no whistler's mother. Chad reports. Page 4

Polarised light was used by Plessey Memories to take this picture of magnetic bubbles (the little white dots) moving along the "TI" bar rows in a bubble memory circuit. To find out more about this important new technology see this week's Data Storage Media Supplement pages 21-26.

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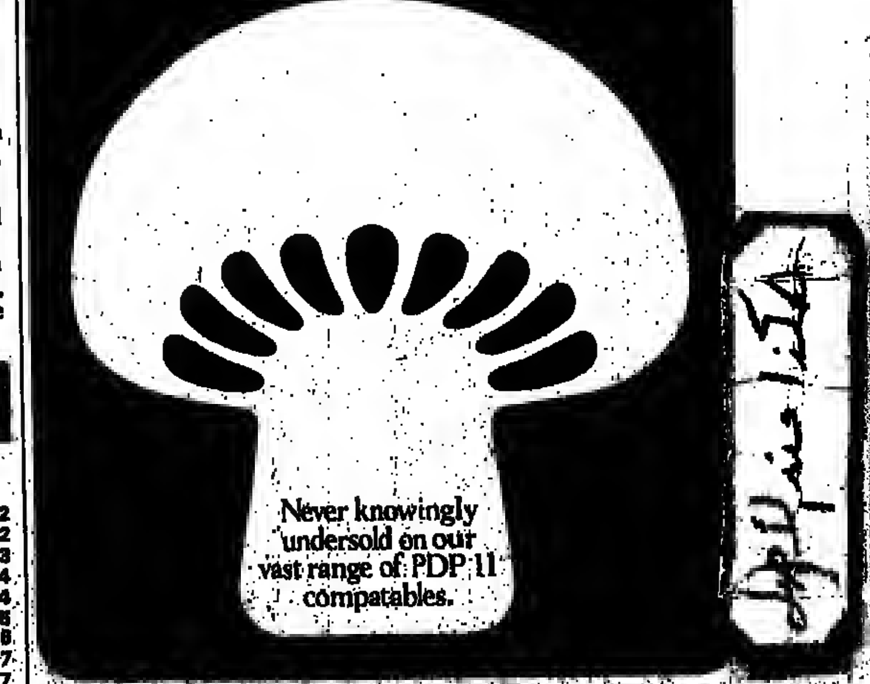

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COMPUTERVIEW

Take a trip in our Delphic Time Machine

THIS week you can take part in a unique experiment: trying to predict the future in the Computer Weekly Delphic poll.

On page 18 we have printed 21 statements about the likely course of computer technology and the social impact of these new developments.

The collective response of Computer Weekly's readers will help to provide a possible shape of computer things to come.

This Delphic poll also kicks off a new Computer Weekly series called Futureview. In this occasional series we will be looking at likely maps of the future through a variety of viewpoints, including science fiction writers, computer technologists and sociologists.

But why bother about the future, when there is so much to report about on what is happening today, next week, next month?

Computer Weekly believes that today's, and some of yesterday's, computer developments will have a major effect on the future, and that there should be national and international awareness that integrated industrial, social and political policies should be developed to take into account the perception of a future which includes the convergence of computer, communications and semiconductor technologies.

Last week's OECD conference on transnational data flows (see page 48) indicates that the importance of computer/communications convergence is being taken seriously.

At a national level, it is encouraging, albeit in a negative way, that computer science has this year escaped relatively lightly in the Science Research Council cutbacks (see page 3).

There is still, however, little indication that computers are being given the right priority in national planning policies.

The magazine Data Processing this month takes Computer Weekly to task for its "ranting" about the need to prepare society for the new information technologies.

"Why should such elevated matters concern the average data processing man to whom the good and powerful thing is still a glorified accounting machine and whose main worry is how to get the best possible deal from his continuous stationery supplier?" asks Data Processing, before answering that:

"Most of the computer community is neither ready for, nor interested in, such action."

That view of the blinkered, nose-to-the-payroll millstone DP person might be true of some people. Fortunately, there are many with a wider vision.

A vision that, while taking in the immediate day-to-day needs, also looks beyond, to see where our industry/profession is taking us.

Looking to the future is not an altruistic pastime for the computer community.

If the future is adequately anticipated, there will be an unprecedented growth in the computer usage market.

And that growth will not be hindered by a neo-Luddite anti-computer uprising, which could well occur if the new information technologies are allowed to be implemented in a haphazard, unplanned way.

Futureview will not set out to solve the problems of the future. But, by providing a regular forum in which to examine the future, it may help to focus attention on the very real and important future issues which could determine the future prosperity of not just the computer industry, but society as a whole.

United front

CONGRATULATIONS to the CSA, DPMA and BCS for their joint document on privacy (page 48).

It is refreshing to see leading representatives of the computer community putting aside their differences to create a united front.

When each of the organisations first presented their cases to the Data Protection Committee, it seemed that the computer community spoke with a multi-forked tongue.

As the DPC has little computer expertise itself, it appeared that the needs of the computer world could easily be ignored.

In his talk to the OECD conference in Vienna last week (page 48), Alan Benjamin, director-general of the CSA, based his paper on the tripartite agreement and received an enthusiastic response from all delegates.

Which just goes to show that unity can mean strength.

Left-wing cloud over Sicob

● **From front page**

processor, but offers five or ten Megabytes on fixed disc, with the option of a second drive with the same capacity, half the storage being exchangeable.

The new Micral V, for Valise, from R2E, is a computer in a suitcase. Priced at about £5,000, it includes a Z80 processor with 32K-bytes of main memory, 150K-bytes on dual density mini-floppy disc drive, 12 line by 40 character plasma display, 32 column thermal printer and programming in Fortran IV and Business Basic. It weighs 14Kg, and can be plugged into the cigar lighter of a car.

Logabax has introduced a new workstation-oriented business system, the LX5200.

Ten years ago...

Computer Weekly September 28, 1967

NEW proposals for increasing the speed of application of computers were promised by the Minister of Technology, Anthony Wedgwood Benn, when he opened the BCS Datafair 67 at Southampton . . . The Post Office's NDPS was invited to set up and manage the £2 million real time system proposed by Customs and Excise and airlines to control imports at Heathrow airport . . . Alcan replaced its IBM 1440 with a Burroughs B2500 . . . ICT received a £1 million boost to its cash flow via its associate company, Computer Leasings . . . The Friden 6810 had its debut at the Business Efficiency Exhibition . . . Louisiana planned a £1 million state databank to be based on a Univac 494 . . . Creed launched a teletype with both upper and lower case characters and controlled by small high-speed solenoids.

FOCUS

...on teaching the academics

SELDOM has the gap between the academic and industrial worlds been wider. The current microprocessor debate highlights the disharmony.

While the DP industry has been welcoming new techniques and distributing resources in all directions, our respected seats of learning have only just begun to get the micro message. It does seem that they do not share similar micro vibes to the rest of us. Whether this is a fault of the manufacturers being dilatory in spreading the news, or the reluctance of the educators to look over their cloistered walls, is a moot point.

The worthy Dons are protesting that they were not consulted before industry let loose the micro multitudes. So yet again the academic world has been caught with its databases and mainframes well and truly exposed.

The recent seminar in Newcastle (CW, September 15) confirms the confusion. Most of those present were connected with universities and gave an overwhelming thumbs-down to the new microprocessing techniques.

While apparently minds have been engaged in interfacing binomial algorithms with Algol-based hierarchies, the more practical world of computing, as found in the everyday installation, has been pioneering new data trails.

However much the worthy professors may berate the latest technology, mini/micros are now an accepted part of the contemporary scene.

Far from being a leap backward, as Professor Dijkstra believes, the latest techniques are light years away from the academics' no doubt more familiar world of Atlas and Mass Array processors.

The commercial success of organisations involved in micros should be more than sufficient to establish the role of the micro in the computer marketplace, with or without the blessings of those assembled at Newcastle.

It could well be that the data cycle has completely revolved. No longer are the universities setting the technological pace. New, exciting discoveries have moved from the technical workshops direct to the installation, by-passing in the process the analytical judgment of the universities. Research is now the prerogative of the suppliers of hard and software.

In supporting the practical DP professional from the slings and arrows of outraged reactionary fortunes, Computer Weekly deserves the thanks of all DPMs.

Perhaps a few arrows should now be aimed at those responsible for the drift between the world of learning and practice. Communications seem to be rapidly deteriorating. Most professional DPMs share the belief that the average lecturer on computing would be quickly out of his depth should he stumble across a real live installation.

The standards which he has been preaching no doubt stem from the days of large mainframes. The carefully structured patterns of DP responsibilities have been blown off course (and chart) by the advent of modular techniques and user department power.

Unfortunately the remoteness is accelerating. Nowhere is it more apparent than in current computer exam syllabuses.

The computer education industry has rightly been criticised for being out of touch with reality. Now it seems computer courses will be out of sight.

It does seem to many of those responsible for practice, the division between education and practice are the ones in need of DP lessons.

Meanwhile the teaching profession should at least accept the advent of the small systems. Microprocessors, as is known, depend largely on logic built into single chips.

Getting the respective [illegible] off the shoulders of the academics and on the blackboard should be receiving urgent attention.

INTERRUPT...

TIME was short. The trainee operator had been given the responsibility of decollating the morning's print-out while the rest of the team coped with a troublesome machine and workload.

Some time later, a rather dejected trainee operator emerged from the plant room. Not only had he decollated the forms across the same address panel with the sharp edged cutter. But he had also decollated his tie.

MORAL. Tieing-up the loose ends is a vital installation rule.

● Submitted by Focus, who receives our £5 Interrupt prize.

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UK firm scores world 'first' in TV sport

"THE most significant TV development for sports coverage since slow motion replay machines were introduced," was how American Broadcasting Corporation production staff described a technique produced by British know-how.

Using the DPE 5000 developed by Quantel Ltd, of Caterham, Surrey, ABC established a world "first" in television broadcasting on September 15. Quantel is part of the Micro Consultants group.

Used during the broadcast of the finals of the World Series Baseball, viewers were shown a computer controlled zoomed-up version of certain incidents. This version captures the incident in detail, no matter how small or insignificant it appears in the original shot.

Quantel's DPE 5000 is a 12in high rack unit which works by digitising a video signal, reconstituting it as required. This equipment is portable and enables other special effects previously available only by means of post-production editing.

The DPE 5000 equipment used by ABC comprised prototype units loaned for the occasion. Production units have been ordered for later this year. The unit costs $125,000 and negotiations between Quantel and other US networks and post-production agencies look like absorbing the whole of the company's production capacity for 1978.

Changes at the top in NCC

TWO senior appointments at the National Computing Centre have been announced following the promotion of Reg Boot to group director, two steps down from the director, David Firnberg; and of Godfrey Hall to publications manager.

Boot, formerly data processing and communications manager, replaces Anthony Chandor, who has gone to Insac Data Systems, the National Enterprise Board's services company, as director of business development (CW, September 15).

Boot will oversee projects on privacy and security, database, communications, microprocessors, methods and Filetab development. Most of these projects are being supported by the Department of Industry to the tune of £1.7 million over three years (CW, March 17).

R. Boot

G. E. Hall

Hall is transferring from the international division to head the publications division.

Publications are one of the NCC's fastest growing activities and last year accounted for £92,000 of NCC income.

Hall replaces John Humphries, who has become the managing director of AKI of Reading, Berkshire.

Computer projects escape SRC axe

COMPUTING research projects funded by the Science Research Council have a good chance of going ahead, despite severe cuts in the council's budget. For the SRC's annual report* shows that, while the nuclear physics budget is being cut by 6.5 per cent and the astronomy and geophysical budgets by 14 per cent a slight increase is planned for the engineering board, which controls computing projects.

The SRC's computing science committee has put up major projects involving a rethink of the fundamentals of programming and distributed computing (CW, April 28). Tony Bamford, head of the committee's secretariat, said the distributed computing project had already won the engineering board's approval, and would go before the full council next month, while a senior official had been put in charge of the programming project.

Bamford said that last year the computing science committee got £160,000 for the distributed computing project on top of its standard budget of £560,000. Grants totalling £315,000 were awarded to university researchers working in the distributed computing field.

Other moves on the computing front last year included the installation of a GEC 4070 and a Prime 300 as the first steps towards providing an interactive computing facility for engineering research (CW, November 4, 1976) and the installation of a second IBM 360/195 as a central facility (CW, August 12, 1976).

Elsewhere in the SRC things were more gloomy last year. The income of £127.7 million, of which £125.1 million came from the government, was down in real terms on the previous year, and this year's budget of £133 million is down again in real terms by 4 per cent.

The SRC chairman, Sir Sam Edwards, said, "From now on it's a very bleak picture. We can't plan as far ahead now as we did in happier days." And the annual report says that by the early 1980s the SRC will not be able to meet its responsibilities adequately.

Sir Sam retires at the end of this month after four years as chairman. His successor is Geoffrey Allen, professor of chemical technology at London's Imperial College. For the last year Professor Allen has been chairman of the SRC's engineering board.

* Report of the Science Research Council for the Year 1976-1077. 115 pp. £2.50. HMSO.

Seminar on disabled

A SEMINAR aimed at dispelling fears about employing the disabled as computing staff, is being organised by the British Computer Society on October 12. One of the speakers will be John Grant, the government Minister responsible for the employment of disabled people.

Grant will also run a question and answer session.

Other speakers will include Reay Atkinson, who will talk about the employment of the disabled by the government, and Lorraine King, chairman of the BCS' specialist group for the disabled. The retiring and incoming BCS presidents, Gerry Fisher and Professor Paul Samet, will introduce the seminar and sum up at the end.

The number of tickets for the afternoon seminar is limited to 150. They can be had free of charge from P. J. Goodayle, 11 Windover Crescent, Lewes, Sussex BN7 1DP.

Datafair tickets available

TICKETS are still available for Datafair, the British Computer Society's biennial conference and exhibition, to be held at London's Cunard International Hotel from October 4-6.

The broad theme of this year's conference is the end user. Tickets cost £97.20 to BCS members, £27 to student members and £113.40 to non-members. Prices include VAT and cover lunches and light refreshments. For full details and bookings contact Ruth Rees, OYEZ-IBC Ltd, Norwich House, Norwich Street, London EC4A 1AB. Telephone 01-242 2481.

Ramis-IMS interface from Mathematica

AN interface between the Ramis information management system and IBM's IMS and DL/I database systems has been released by Ramis developers Mathematica, of New Jersey.

Such a capability has been eagerly awaited by a number of Ramis users already using IMS software, and the interface was developed primarily owing to user demand.

"Several users collaborated in drawing up the specifications," said Frank Fish, of Mathematica.

Ramis incorporates its own database capabilities, so IMS could be seen as a competitor, "but we don't come across many virgin installations," said Fish. "Most users already have considerable software, and if someone has a large investment in IMS, he will often want Ramis to accommodate this."

The interface can greatly simplify IMS access, Mathematica contends. A retrieval command is issued in the near-English Ramis non-procedural language, and the data is delivered back through Ramis' standard reporting utility. It can either be printed as a direct report, or input to programs for further processing. The end user need not be aware of IMS procedures.

The structure of the IMS database must, of course, be initially described to Ramis, but once this has been done, a variety of applications may access the same database through the same description.

An important feature of the interface is that the conditions placed on the data items to be accessed are translated directly into IMS conditions, and only the data items satisfying these conditions are retrieved. Some competitive products for simplified IMS interfacing retrieve many more records and do the selection after retrieval.

Ramis already has an interface to Software AG's Adabas database management system, developed by a user. At least one user has implemented an interface to Cincom's Total; but, unlike the IMS and Adabas interfaces, this is not available through Mathematica.

The IMS interface is priced at £3,140, or £125 a month for 30 months. For orders placed before December 1, Mathematica is charging £2,300 or £90 per month.

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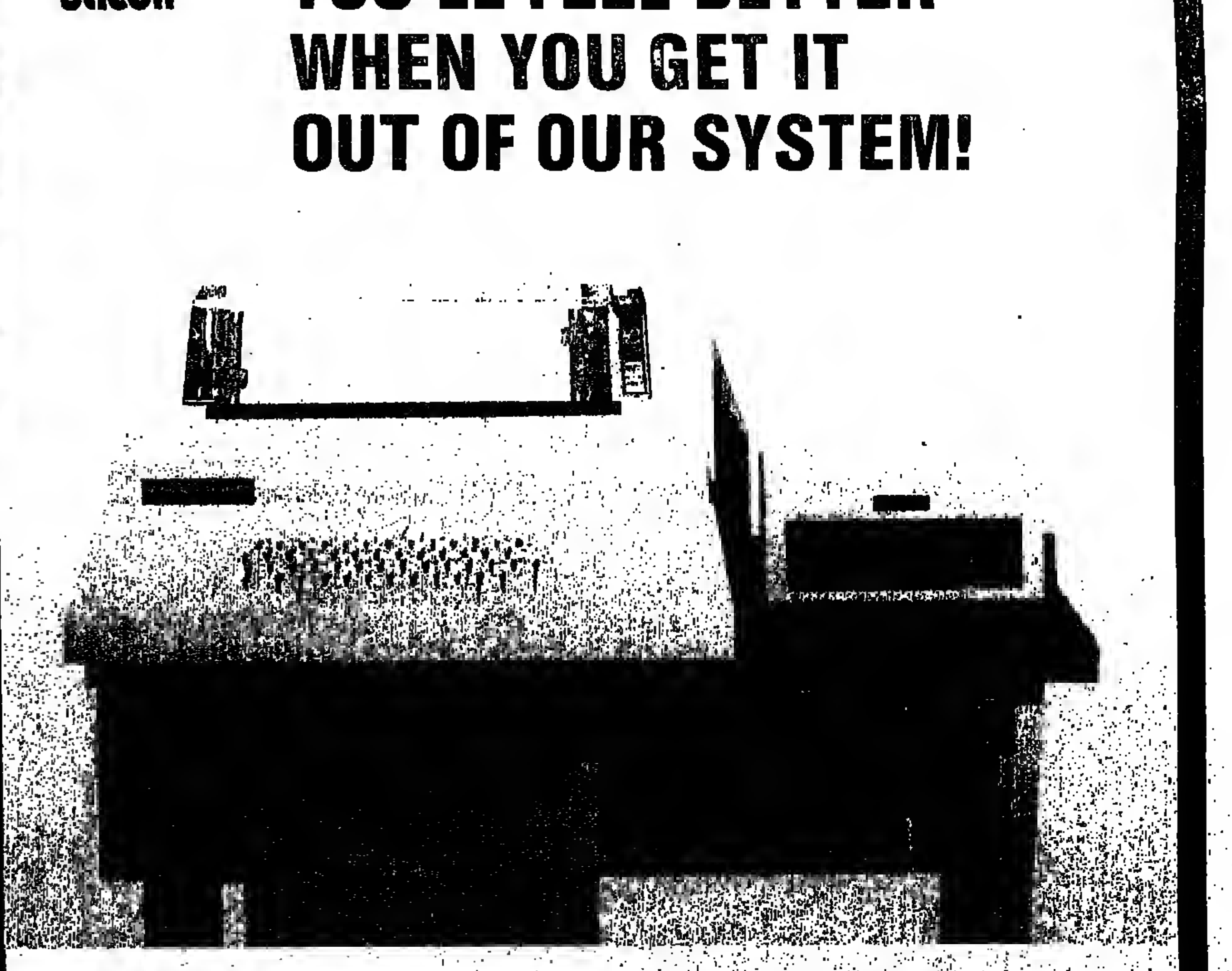

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DOWNTIME by Chad

Logical approach to whistling

CATCH a plane to Carson City, Nevada right now and you will be just in time for the world's first International whistling contest — and the opportunity to whistle along with a computer.

Dubbed a "whistle-off," the contest is the novel idea of that larger-than-life British expatriate, John Peers.

A former managing director of Allied Business Systems, Peers is now president of Logical Business Machines, Lomac, the Sunnyvale, California, firm that builds Adam, which Peers calls the world's first "no software" computer (CW, November 18, 1976).

Adopting the slogan "Pucker Power," the contest will be open to any individual, family or group who think they can whistle a tune without the aid of a mechanical contrivance.

But in one of the 12 categories open to contestants, they will at least have the assistance of an electronic contrivance in the form of an Adam computer. Lomac has programmed an Adam to whistle the song "My Way," (I did it etc).

Some of the other categories include family whistling, hymn whistling, all male whistling, senior citizen whistling (gasping not allowed), foreign language whistling (á la Italian gigolo), and whistling to a novel accompaniment (saw, bicycle pumps, etc).

Winners will be awarded suitably engraved giant working whistles.

Organised jointly by Lomac and the Carson City Chamber of Commerce the "whistle off" will take place from October 1/3 and the majority of entrants will be from all over the US.

How to relax...

One high powered businessman who is not highly strung or fretful is Brian Warrington, managing director of terminal manufacturer Anderson Jacobson. A devotee of Bach and Segovia, he says an hour's playing of the classical guitar is totally unwinding even after the most strenuous day. And it's much less energetic than jogging.

Getting your number

FOR those who believe that civilised life came to an end with the invention of the telephone, further incontrovertible evidence for their case comes, needless to say, from the home of the brave and land of the free.

A small company based in the steel and concrete of Fort Lauderdale, Florida, has come up with a computer-controlled automated dialler and recorded message player, which chooses your telephone number at random — and rings you up to tell you something you don't want to know.

It's great for the information supplier, since it can cost as little as a cent a call, which is much less than the cost of having human fingers doing the dialling, or sending a letter.

It appears that the originator, Digital Products Corp, has had inquiries from the UK — so don't be too sure it couldn't happen here.

One small redeeming feature: When you are summoned from the bath or your favourite TV programme to answer the computer, your response is recorded, and the computer is not yet programmed to delete the expletives.

If enough people tell the fiendish device what it can do with its unsolicited information, perhaps the perpetrators will think again. Otherwise, it sounds like a good reason for having the 'phone taken out.

Story with a moral

OUR new Interrupt feature on page 2 has led to a large response from readers sending in their own modern Aesop's fables with a moral.

The following was sent by M. I. Lindsey of Newport, Gwent. Although it is not in the mainstream of Interrupt "real world" experiences, it deserves a special £5 Downtime prize.

Mr Lindsey writes:

Once upon a time there were two Roman Chariot racers. There was much rivalry between the pair and all Rome was agog with which would win the forthcoming "Grand Prix."

At about that time rumours were rife about a new high technology chariot wheel. The first charioteer ignored the rumours, but the second followed the description and reporting in "Chariot Weekly" with great interest.

The new wheel turned out to be round whereas the old well-tried version was square. The second charioteer fitted and tested the new wheels.

Come the great day, the old square wheel veteran was left standing.

The moral of this story is "Read your Computer Weekly and don't be left standing!"

Robin Webster reports on the Diebold-Europe conference

Electronic mail will launch office of future

ELECTRONIC mail will be a "launching vehicle for the office of the future" according to John Gilbert, director of management information services for the US Army Material Development and Readiness Command.

Speaking at the 39th conference organised by Diebold Research Program-Europe, last week, he described the facilities of electronic mail, concentrating on the Arpanet network in the US, and the services offered via it.

Main theme of the conference, at the Hotel Intercontinental, London, was "Office of the future and manpower productivity in ADP," and three areas in this field: the technology, the effect on productivity, and policies related to it.

"A whole range of services will be offered for the office of the future that we see coming," said Gilbert, "such as digitally stored graphics and telephone calls in electronic mailboxes."

Also, with the introduction of microprocessors, and home computers, he saw direct "personal computer to personal computer" transmission of messages. Present costs of a typical 1,000 word message on the Arpanet network was about $2.5, making it already competitive with conventional methods when all office preparation costs are taken into account.

"But these costs will fall," he said.

The disadvantage of present systems, such as the telephone, were that they had created the problem of the "missed telephone call."

"Somebody is trying to get you when you are not available, and they are not there when you try to get them.

"This problem is eliminated with electronic mailboxes, which can store messages with details of when it arrived and who sent it. There is no need to use the phone here, as you can make your reply for him to read at his leisure."

John Gilbert, director of management information systems for the US Army Material Development and Readiness Command . . . "A whole range of services will be offered for the office of the future that we see coming."

Electronic mail, however, goes beyond the simple technique of communicating a message between two individuals.

"Via the net other advanced facilities, such as spelling correctors, calendars, reminders, and directories, are available," he said. "Whenever I type in a message now I immediately run a spelling correction, and so have cut down on my error rate. Under development now are other services such as co-ordinated calendars which, on request, work out the ideal day for a meeting of many individuals by searching their calendars."

One area in which the service has not been able to make much headway is in teleconferencing, he says. This is probably due to the fact that most conferences need to come to a conclusion in a fixed period of time and that a face-to-face meeting is sometimes required to sort out a misunderstanding. Where it did appear to help was in preparing delegates for the meeting by raising points that might have been overlooked.

Gilbert says that he now carries a portable Texas Instrument terminal with him most of the time, even when travelling, so that he can access the service wherever he is.

"I think of it as a mobile office," he said. "I find I can keep up-to-date on decisions, and this is a tremendous advantage. I also find that my travel habits have altered. I used to travel at least once a month in the US, but this period is now about once every six months."

Despite this, he says, the need to go to the office will not disappear. It just means that the more people that come on to systems like this, the less travelling will be needed."

Tennis system on trial

A COMPUTER controlled line call system has its first major trial this week in the Power tennis series in Edinburgh.

The system, called Subsol Electronic Line-Call, has been developed over seven years by Dr David Supran and sports equipment manufacturer Slazengers.

Cables linked to a minicomputer are laid just outside the white lines on a tennis court and the tennis balls have steel woven into the cover. When the ball bounces just outside the white line the steel woven into it completes a circuit across the cable and a signal is sent to the minicomputer.

The system works a light on the umpire's control box showing him whether the ball was in or out, and also emits an audible bleep to inform the players and spectators.

Slazengers say the system has already been tested by top players, including Britain's Ann Jones and Mark Cox, and that they were happy with it.

Dr Supran is now working to overcome the problems of using the system on grass courts so that it could be considered for Wimbledon.

Agreement on 2900 compiler

FORMAL agreement has been reached between ICL and the South-West Universities Regional Computing Centre, on the development of an Algol 68 compiler for the ICL 2900 series. The compiler is scheduled for release in October next year, and will be part of ICL's standard product range.

Development is in the hands of small teams at SWURCC and Oxford University, with some help from the Royal Signals and Radar Establishment, where the language was originally devised.

The basis of the product's source-code analysis elements will be a portable Algol 68 compiler developed at RSRE. The specific translator to generate 2900 object code is being developed at Oxford. SWURCC's task will be to integrate the product.

ICL will give a royalty payment to the development team on each sale of the compiler, but to the user it will look exactly as if it were developed within ICL. "Front-line support will be provided by ICL," said Martyn Thomas, of SWURCC, head of the project. "The development team will function in the same way as ICL's internal compiler teams, being consulted by the front-line people on particularly difficult support problems."

In the future, support would come entirely from ICL, but a firm date for the handover has not yet been fixed.

The 2900 Algol 68 will be enhanced beyond the facilities provided in RSRE's Algol 68R compiler for the ICL 1900 range, and is intended to conform closely to the Algol 68 Revised Report. Particular advances in compiler design will be in the area of recover from compile-time syntax errors — so that a genuine error does not cause several false errors to be indicated — and in independent compilation of program modules.

Programmer killed in pub

A 31 YEAR-OLD contract programming administrator with Knight Computer Projects, Michael Turner, died in a London pub on Friday evening following an attack by one of two men who had been troubling customers.

When ordered to leave by the licensee of the Rose and Crown in Old Park Lane, one of the attackers picked up a soda syphon and struck Turner three times before running away.

Turner, better known as Michael Holden, a TV actor who appeared in Please Sir and The Owl Service, had joined Knight Computer Projects only seven months previously.

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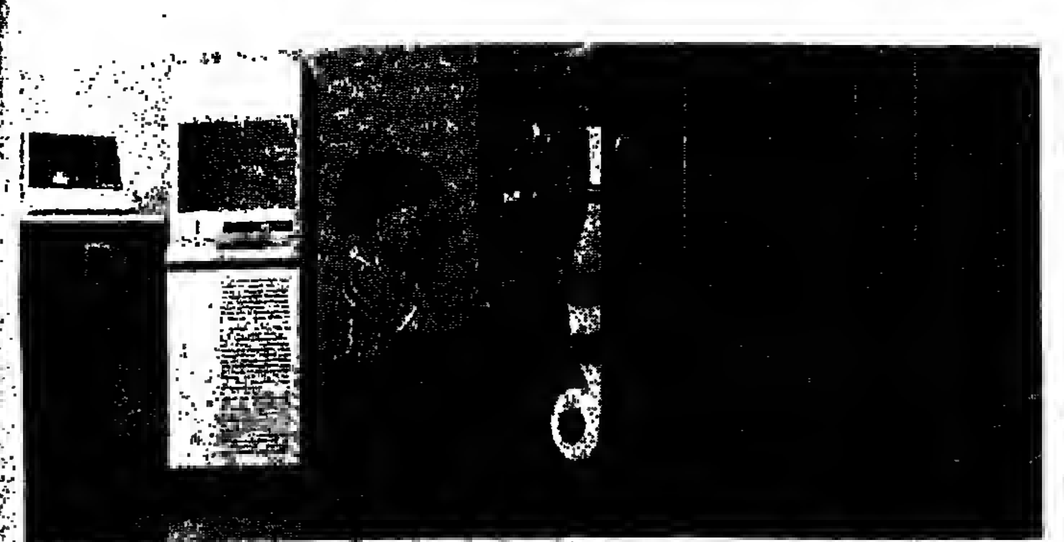

Designed to operate as an offline configuration, the Page Printing System from Honeywell is controlled by a Honeywell Level 6 minicomputer which can be seen in the picture just behind the operator. She is loading a metal cylinder for printing form lines on to the plain dielectric paper used by the PPS. The collator/stackers are seen on the right.

Honeywell page printing system aimed at rivals' European customers

WITH the aim of gaining a solid foothold at its competitors' big customer sites in Europe, Honeywell has launched the Page Printing System, PPS. This runs at up to 18,000 lpm and operates offline, accepting magnetic tapes from any type of mainframe. IBM users interested in an alternative to the IBM 3800 electrographic printer are seen as the most important group of potential customers, although in the UK, ICL users are also being strongly wooed.

The PPS has been test marketed in the US for two years and was officially launched earlier this year. It was shown at the National Computer Conference in Dallas (CW, June 23), and Honeywell says it has installed 100 systems in the US to date.

The PPS differs from the IBM 3800 in several important respects, including the printing technology it employs, and the fact that it delivers individual pages. These can be cut to a specified length and can be stacked and collated in the same pass to produce multiple copies of a report, for example.

The whole process is controlled by a Honeywell Level 6 minicomputer which also handles page formatting and the selection of the print fount. This can be one of several, because the PPS uses a 200 dots per inch matrix printing technique. The non-impact electrostatic process fuses electronic images on to dielectric paper, which then passes through liquid ink which adheres to the paper.

Honeywell will supply the special paper to customers in Europe at the moment, although independent sources are in the process of being approved. The paper will cost about £30 for a 3,500-foot roll.

Another manufacturer challenging the IBM 3800 with a high speed printer system is Siemens with its ND-2. This is now being sold worldwide by Itel (CW, September 1), and is also available from Computer Peripherals Inc, the joint ICL/CDC/NCR operation.

In addition, Xerox in the US now has an 18,000 lpm printer, the 9700 (CW, June 9), that can deliver individual pages like the Honeywell PPS. The 9700 uses a laser beam to print both data and the form lines on to plain paper. The PPS uses a rotating metal cylinder to print form lines.

The PPS is being exhibited for the first time in the UK at the International Business Show in Birmingham from October 11 to 20 and is being sold by a special PPS marketing organisation. Its director is John Macdonald, a senior Honeywell executive who has been director of strategic and product marketing for the last two years.

The PPS comes in three basic versions running at 8,000, 12,000 and 18,000 lines per minute and costing between £110,000 and £200,000. The 18,000 lpm version prints 210 pages per minute.

Honeywell estimates that there are 1,000 potential PPS customers in the UK alone.

Post Office union calls off 'blacking' action

ACTION by the London City branch of the Post Office Engineering Union to black connection of privately-acquired data equipment to leased lines, has been called off following an agreement by the Post Office to offer 4800 bps modems in competition with private suppliers.

"We are more than willing to compete against any company in this field," H. P. Campbell, POEU London City branch secretary told Computer Weekly, "but we are not prepared to give away our market to anyone without at least a fair chance to compete.

"Until the 4800 modem was introduced, the Post Office had 90 per cent of the market on the 2400 service. But Europe then standardised on 4800 bps, and the Post Office was caught unawares through no fault of its own. As there was no adequate British product, a development contract was given to Plessey, but it got very low priority. Racal was given permission to supply a 4800 modem in the meantime, and overnight my members began to lose work: by the end of 1976 our share had fallen from 90 per cent to 80 per cent."

Campbell pointed out that, contrary to statements made by spokesmen at union headquarters, the dispute was official. He also emphasised that there had been no question of a strike over the issue.

"After waiting several months, we simply blacked all leased lines so as to push the Post Office into honouring the agreement they entered into with the POEU," he said.

Cray 1 for oil rig designs

LARGE scale structural analyses of giant oil rig designs will be one of the main applications for a Cray-1 parallel processor ordered by the US bureau United Computing Systems, of Kansas City.

Its UK subsidiary, London United Computing Services, which already has a time sharing link to UCS will provide UK customers with high speed access to the Cray-1.

OP SPOT

In response to a recent Op Spot article on the changing role of the operator, we publish this week some reflections by the chairman of the George 2 User Group. Further comments on changes caused by the use of operating systems would be welcomed.

'Greatest thing since sliced bread'

"GEORGE 2 is the greatest thing since sliced bread, in that it is convenient, it does the job efficiently, and it saves a lot of work. Yet somehow, remembering the 'good old manual days'; it does not seem to have the flavour of a home baked loaf."

So says Ron Linton in response to the recent Op Spot article (CW, September 1), which discussed operating systems and the changing role of the operator.

In an interesting and informative letter, Linton, computer operations controller at Manchester Polytechnic, relates some of his experiences with ICL software.

According to Linton, both his operators and management were content with the manner in which the ICL 1902T was used. At that time no operating system was being used other than the basic manual executive.

He says, "Like many others, I loved the days when a quick-witted operator could make the machine stand on its head and sing, and regarded the apparent need for an operating system with some distrust.

"A steady increase in the number of programs run per day, and a corresponding decrease in the time left over for coffee-breaks, TV reviews, etc, persuaded us to install George 1S, and behold — the incidence of cramped fingers dropped, feet-up time increased, and morale rose."

George 1S is a simple system which aims to replace the basic operator functions of loading, entering and deleting programs. During the period in which this system was used the workload increased and a new solution had to be found — George 2.

"This operating system provides comprehensive facilities for storing operating instructions, in the form of macros, including a choice of action according to events occurring during the run of a program. It also provides spooling facilities to offline the use of slow peripherals, so that two or three programs can run in parallel with each one thinking that it is using the one and only printer or reader," says Linton.

The operators soon became familiar with the new system. Instead of being basically involved with the mainframe, they became more concerned with getting the best out of George 2's capabilities.

"Unlike the rather despotic George 3, we found George 2 relatively easy to tweak, bend, and otherwise push into shape; we could not exactly make it stand on its head and sing, but it would bend over and hum when ordered. The operator's frustrated interests in juggling the mainframe were soon diverted to tuning George 2, and everyone was happy — especially the users, whose mean turnround time was reduced considerably."

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PRIME

MICHIE'S PRIVATEVIEW

The father of all the Dijkstras

"NOT my punch-up!" would be a natural attitude to sdopt to the furore following Dijkstra's ssertion that microprocessors heve put computing back by 20 yeers. Yet the Dijkstra philosophy haa been the source of high-minded obstructionism aince the dewn of intellectual hietory.

Let ua start with the father of all the Dijkstras, the Greek philosopher Plato. Great intellect, atrenuous aspiration, merciless principles and good taste in ceaseless inner wsr with soaring imagination — this learned man was a veritable aristocrat of the humen soul. Perhaps the reeder begins to recognise the portrait.

Allied with intellect was a aelf-righteousneaa of such stupendous dimensions that every topic wes turned into an occasion for explaining to those present how confused, how ignorant, how downright grubby they all were. Invited to lecture at Syracuse by the Sicilian dictator Dionysius the Elder, Plato used the occasion for a sermon on the principlea of abstract justice and their inconsistency with the institution of dictatorship. This was counter-productive enough to deprive him of any further hearing in that quarter (Herb Grosch and other human rights ego-trippers please note).

And what about Plato's attitude to hardware innovations? Things like microprocessors, let us say, or whatever was the equivalent in his time and context?

Two mathematicians, Eudoxus and Archylas, developed a device for machine-aided theorem-proving. When their audacious coup came to Plato's attention, his outburst was a five-star affair beside which Dijkstra's remark must be classified as a well-bred clearing of the throat. The indignity, the disgrace, that the pure objects of disembodied thought should be dragged down to base meterial implementation, and that colleagues should so forget themselves as to behave like mechanics!

It is not recorded by how many years Plato considered that mathematical science had been put back. It is known, however, thet his blast was a good deal more influential thsn Dijkstra's is likely to be. Plato's sttack so destroyed the academic credit of the work and of machine-building in general that it had thenceforth to depend on military funding.

But has computing ever helped reol mathematics? Had not Plato, perheps, half a point? Until last year maybe he had. But no-one can deny the place of the Four Colour Theorem in "reel" mathematics, nor that it was subjected for e century to energetic attack *without* mechenical aids, and that these did not prevell. The problem finelly yielded to an approach based on heavy-duty computing. In spite of pooh-poohing by a few mathematicians who have concluded in retrospect that the theorem was not all that interesting anyway, most of those with whom I hsve talked rate it an early success in a growing assault on otherwise insscessible levels of complexity.

The *reductio ad absurdum* for the elitist intellectual is to query his need for books. A book is a sort of external mechanical aid to the intellect – rather a passive one. Why should a true intellectual need any of that?

In his Phoedrus, Pleto has Socrates tell a story sbout the Egyptien god Thoth, who goes to the god-king Thamous and says: "My Lord, I have invented this ingenious thing celled *writing*, and it will improve both the wisdom and the memory of the Egyptians." Thamous replies that, on the contrary, writing is an inferior subsitute for memory and understanding. Men will be led to think that wisdom resides in writings, whereas wisdom must be in the mind.

Such considerations did not inhibit Plato himself from the use of writing. But of course a thing is alwaye different when we do it ourselves, for then we can be quite sure it is done right!

It is tempting, having dredged up a few jokes from e mis-spent youth, to leave the Platonic species of theoretician alone. But scientists of many descriptions, including myself, hsve suffered much. Let ua not forget thst it was the vindictive opposition of the academic super-snobs at Princeton's institute for Advenced Study that hounded the JOHNNIAC project out of their doors. The greet von Neumann had to see his breinchild moved to the West Coast for completion.

I also do not forget the tale told me of early days in computational chemistry when one of ths most illustrious of Britein's theoretical chemists bitterly harried early computing work on molecular orbitals. On what grounds? The Plato-Dijkstre grounds: "confused, ignorant, end ... ah, well, one hates to say this, but one hes a duty, ... grubby!"

That project fared better then that of Archylas end Eudoxus. Whet has been accomplished by the new computationel methods, so chemists tell me, already dwarfs the brilliant individual contributions of the Platonic pioneers of theoretical chemistry.

The Platonic conceits, it must be conceded, are typically expressed in an artificially flamboyant public atyle. More humane and flexible intuitions are not uncommonly brought to bear in private. It would be grudging on my pert not to allow early memories to add a drop of honey.

In 1960 Edinburgh received a visit from Dijkstre. Aa one of a large audience I sat ond listened, spellbound by certain Delphic intensities which seemed to speak to him from the depths of Algol 60. Afterwards he insisted on knowing why I had with my own hands just completed a machine from 300 Swan Vestes matchboxes and a thousand or so coloured glass beads. Our discussion enabled me, computational fledgling that I was, to find courage to plunge along the path of matamorphosis from genetics to machine intelligence.

So you never can tell. The next thing to happen will be a treatise from Dijkstra on microprocesaor design. What a fine enrichment for us all that will bs!

SOFTWARE FILE

EDITED BY STEPHEN BELL

US tribute to UK database expertise

THE vslue of UK expertise to the progreas of databsse technology was underlined last week by John P. Rundell, one of Honeywell's US datsbsse experts.

In sn interview with Computer Weekly, Rundell cited his respect for UK expertise ss one of his chief reasons for msking e brief visit to London last week, to deliver e paper to a dotabaee conference organiaed by On-line (CW, July 21).

"UK people are very knowledgeable in the database area, and thia ie evidenced by their lerge representation on Codasyl's databese committeea," he said.

Rundell ia vice-chairman of Codasyl's database language task group, and a delegete to the Codasyl Cobol committee (previously known ea the Programming Language Committee).

Rundell's Codasyl involvement has considerable relevance to his mein activitiea within Honeywell. A systems programmer for database systems software, he is one of a team of four or five working on the development of Honeywell's IDS II database mansgement system, which uses the Codasyl approach.

His particular concern is with the data management language and with closely connected aspects.

His London paper, entitled "The Simulation Technique as a Method of Schema/Subschema Mapping," showed some of the approaches he had employed to contribute to the main aim of the IDS II development — improved performance and reduced memory requirement.

A Codasyl datebase description includes a schema (a description of all the dote in the databsse end its relationships) and several subschemas (descriptions of the view of the dsta by a particular set of users). One approach is to bring both these descriptions into memory when the database is being accessed.

If n data item is described by the schems in e different way from thst required by the subschems, the conversion is performed at run-time, by reference to the two descriptions.

IDS II employs a different approach, bringing in only the subschema and such schema features as ere immediately relevant to the subschema, or are required for detabase integrity. The Honeywell system develops conversion subroutines at compile time. Hence, at run-time, it does not need to refer to the descriptions of the data item concerned. This clearly saves running time.

Deciding how much of the schemo needa to be held is e difficult problem, sold Rundell.

IDS II uses e "simulation" technique, whereby it runs through e repertoire of the velid data menagement language functions which could be performed againat the subschema. Any edditionel portions of the schema which are used in the execution of these commands is marked for inclusion at run-time.

If they are used, they can be weeded out at compilation time, rather than at run-time.

These innovations in IDS II represented a large clrnnge from the status of the original IDS Rundell agreed. IDS was originally defined within Gener. Electric, before Codasyl began its database deliberations. Codasyl ideas had drawn heavily on IDS, but Codasyl concepts have matured and changed over the seven years since then. It's the IDS II release, IDS is caught up with Codasyl.

Most of the Codasyl changes had come about as the result of practical experience of its techniques, he said.

The relational approach to database, one of the major techniques to Codasyl, is not treated as relatively novel. On the contrary, Rundell emphasised, the two approaches dealt with at about the same time. Codasyl ideas, however, have gained far greater public acceptance. The relative efficiency of the Codasyl approach was one of the biggest factors in its acceptance, Rundell maintained.

The quick gain of acceptance users for the Codasyl system was itself influential in persuading further growth, and the reputation of the Codasyl approach was enhanced by the formation of a committee to regulate its development. The relational approach still has an equivalent body.

Development of the Forte Interface was one of the elements in Aberdeen's agreement to install a dual Honeywell 66 (CW, July 21).

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Benelux outlet for UK firm

AN agency agreement concluded last week with s Dutch company expands the outlets for Compute Bridgend's range of software products, to include the Benelux countries. The agent is softwara house Corodale BV, of Amsterdam.

The UK company, bssed in London and Bridgend, Glamorgan, markets Selupd, a source library maintenance product, Selcopy, to copy, print and interrogate files, Cblvtoc, to display and modify IBM Volume Table of Contents entries, end Cbldoc, for Cobol documentation.

There is alresdy one user of the company's products in Holland, but this sale was made before the agency was set up.

Informatics launch for DEC systems

THE first venture outside the IBM mainfrsme markst by US software company Informatics was officially snnounced last week. The company hss acknowledged the rapid growth of minicomputer-besed distributed processing by releasing software to handle data entry and vslidation on s Digital Equipment PDP-11.

The product, Series IV, has already gained several users, including one with a 14-processor network. Series IV is siso the first Informatics product to have been designed entirely in Europe. There are "three or four" installations in the US, said a spokesman, but officiel US release is scheduled for next Janusry.

Using peremetrised ststements, Series IV sllows the user tó define the structure of records to be put on a file snd the validstion criteria for thsir vsrious data fields.

Fields can be validsted for character type, range and accordance with other mathemstical formulse, snd can be handled in isolation or in juxtaposition with other fields.

As with an increasing number of online products, screen formats are designed directly on to the screen, without using forms. The software operates under DEC's RSX-11M operating system, and can handle eight screens and eight different applications concurrently. It would be simple to extend this figure to 16, said Informatics.

The product was acquired from a Geneva company, Services Informatique SA, snd Informatics, at ths same time, took on the company's two-man staff.

One of the first UK users of Series IV is the Computel bureau, which is offering it as a service.

Survey package will save time on site

A CO-OPERATIVE effort between two consultsncies has brought the general release of a softwsre sid to surveyors. The Eclipse Survey Package, designed to run on the Wsng 2200 desk top computer, was developed by Eclipse Computer Consultsnts. Lacking the resources for e full-scale marketing effort, Eclipse engaged Hill Price Davison.

The survey package interprsts field observstions and builds s model of a site, including grounid levels, interpolsted from observstions, and the locations of significant features on the site. This allows much of the work which previously hed to be done on the site to be psrformed in the office. Features of the modal can be smended, and diegrammatic output can be obtained on a flatbed plotter. The software will be sold aa a package with e Wang 2200, end a plottar end cassette tape storage, ss options.

The minimal Weng system with the softwere is priced at £18,900.

Verse frees programmer from file chores

LATEST aid for the increasing community of online programmers has emerged from Dataskil. The company hes produced an interactive visual display-based text editing system, known as Verse, and aimed primarily et the editing of program source text. Verse runs on the ICL 2903 and 2904.

Despite soms early doubts as to the cost-effectiveness of online programming, users are increasingly coming round to the view that the costs of the software and terminals are amply compensated by savings in programmer time and effort.

An aid such ss Verse makes a large contribution to these savinge, by freeing the programmer from file "housekeeping" chores, and allowing him or her to concentrate on error diegnoels end correction.

The package carries an initial price of £1,000, end an annual charge of £150. Rental price is £57 a month. Dataskil is offering e month's free trial.

PROGRAMMER NOTES

Good JCL design

SEVERAL editions of Programmer Notes have commented on likes and dislikes in programming languages, and on programming techniques. But an important part of the programmer's work has, to date, been ignored: the preparation of job control language statements.

Most installations nowadays have a sophisticated enough operating system and complicated enough applications to necessitate complex JCL. Although composing a complex job-control string can be almost as error-prone as a small program, problems of JCL programming do not seem to have been tackled by eny of the multitude of sources which advise on programming languages.

A great many programmers complain that JCLs are badly designed; abbreviated commands and strings of unidentified operands in inflexible format make programming difficult, and error diagnosis leaves much-to be desired.

Widely used programming languages are few in number, and most of them are reasonably portable. Standards and portability in the JCL arena are still almost non-existent. The languages vary widely, even between different operating systems on the same machine.

Do many of our readers feel strongly about the shortcomings of JCLs, or do you accept them as an inevitable drawback in a minor area of your job? What do you see as the worst failings which could be corrected?

To complement the frequent programming advice in Programmer Notes perhaps some of our readers can offer some hints on designing good JCL for production runs.

An immediate problem is the responsibility for this job. Is it performed by 'the programmers, the operators, or the two in co-operation? The function would certainly seem to require some liaison, to ensure that the system's practical behaviour is suited to the operating environment (CW, September 8).

Munich date for joint conference

THE successful joint European/US software management conference, held last year in Washington, and earlier this year in London (CW, March 24), is to be repeated in an updated form, in Munich.

Scheduled for November 14-15, the conference includes most of the same speakers as at the first event, giving addresses with the same titles, but developments in the interim will give the content e substantially new flavour.

Progress of such major projects as the US Department of Defence standard real time language development are likely to arouse particular interest. The collected ideas of government bodies, international organisations such as NATO and large industrial users on techniques for development of large projects should, however, prove of general value.

The conference is sponsored jointly by the American Institute of Aeronautics and Astronautics, and its German equivalent, the Deutsche Gesellschaft fur Luft- und Raumfehrt.

Fee for the conference is $250 (£145), or $230 (£133) for members of sponsoring organisations and government and university staff. Application in the UK should be made through Slate of the Art Ltd, John Carpenter House, John Carpenter Street, London EC4.

Puzzler

TWO bricklayers, Bill and Fred, start work on a new site. Their first job is to build a series of standard walls, each containing the same number of bricks. After several weeks the foreman gets to know from experience that if the two men work independently Bill always takes nine hours to build one of the walls, whereas Fred takes ten hours. He also notices that when Bill and Fred work together, ten fewer bricks than one would expect get laid per hour, due to occasional conversation between them.

One day the foreman wants a standard wall built in a hurry so he puts both men to work on it (although knowing that they will chat in the usual way). The job then takes exactly five hours. How many bricks does the wall contain?

Solution on page 17

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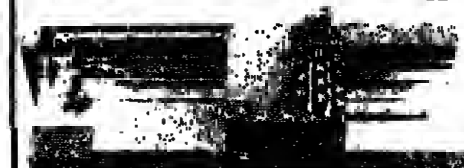

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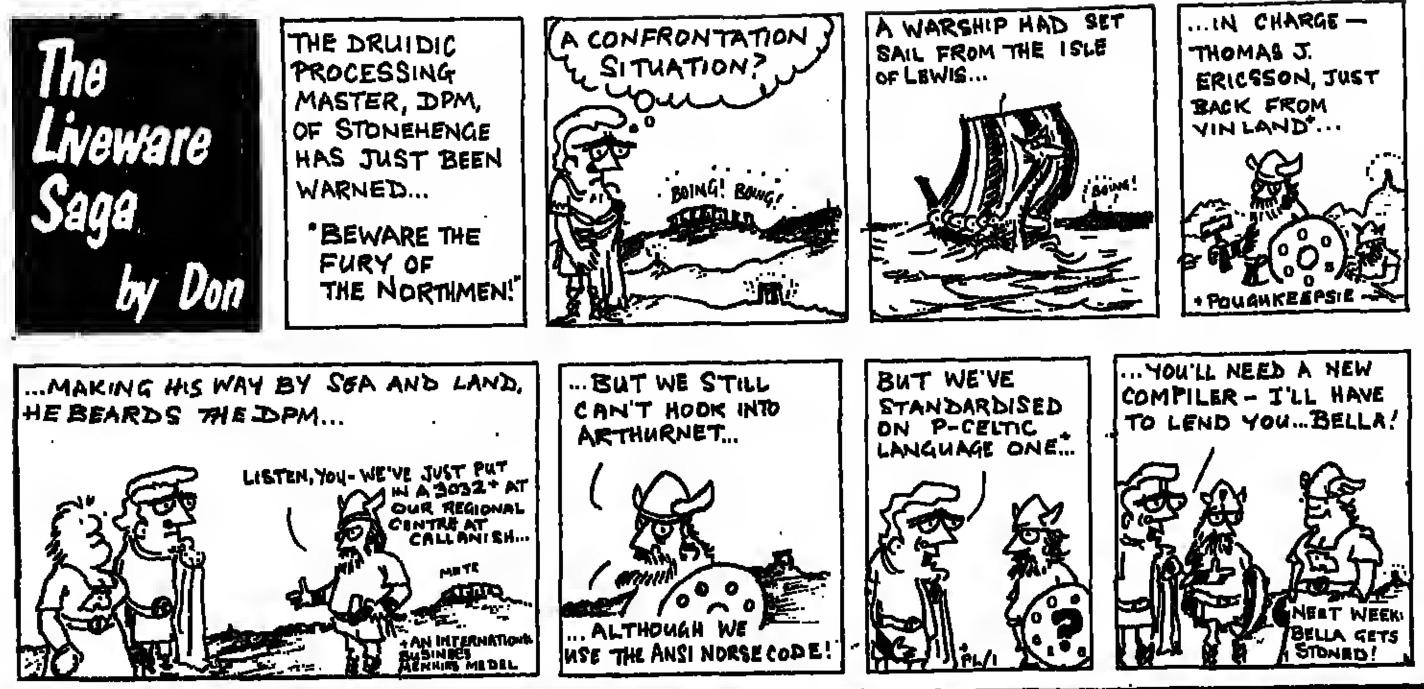

PEOPLE

Two board appointments at IBM(UK)

APPOINTED to the board of IBM (UK) Laboratories, a subsidiary of IBM (UK) Holdings is David Cuzner who has also been appointed Hursley laboratory director. He has been associated with the laboratory at Hursley, near Winchester, since 1961 where until 1966 he worked on the development of the IBM System/360 Model 40 and Model 44 computers.

After an assignment at IBM's Kingston (US) laboratory in 72-73, he returned to Hursley as manager of development and technical services, and was subsequently appointed laboratory manager in 1976.

A further appointment announced to the board of IBM (UK) Rentals, another subsidiary of IBM (UK) Holdings is that of Tony Cleaver. He was appointed director of the data processing division in June 1977.

Cleaver joined IBM's education department in 1962. In 1974, he became finance district manager, and subsequently was appointed DP sales manager in 1976.

University Computing has appointed Christopher Torbé as chief accountant. After a degree in engineering and business studies, he joined a firm of chartered accountants in Birmingham to complete his articleship and qualified as a chartered accountant.

Andrew Reekie, group accountant of Macfarlane Group (Clansman) Ltd of Glasgow has now been appointed financial director of the company.

NCR Corp has appointed Manual Garcia as a senior vice president. He will be assigned initially in the company's worldwide marketing operations. Garcia was formerly a vice president and group executive of the Burroughs Corp.

Quadrant Computer Services Group based at Altrincham, near Manchester has made the following appointments within the group:

Bob Trevor becomes regional manager from being manager of commercial applications group. Bob Jaques becomes regional marketing manager and previously worked for various clients of the group. Roy Riley, having been a project manager, becomes manager of commercial applications group. And Hywel Roberts, having successfully worked on-site for Qudrant clients, has been appointed manager first time user group.

Cuzner Cleaver Torbé Chatwin

Brian Birtwistle has been appointed director of D. K. Wright (Sales and Marketing) within the D. K. Wright Organisation. Prior to this appointment he has had an extensive career in the computer industry with AEI, Honeywell Information Systems and latterly with ADP Network Services.

Having previously been deputy managing director of the Sheffield-based industrial computing specialist, GMS Computing, Martin Chatwin has now been appointed managing director of the company.

Peter Gray has been appointed a director of Bribond Printed Circuits of Chichester, Sussex, a subsidiary of Ultra Electronic (Components). He joined the company as technical manager in 1070, and was made general manager in 1973.

CCC names five

A number of appointments have been made by Central Computing Consultants. Stella Mitchell has been appointed manager at Kingston-upon-Thames office. She used to be a branch manager with ICL Dataskil. Yvonne Gibson previously a partner in Jupiter Appointments has joined CCC as DP recruitment consultant. Clive Hartrup who used to be with Vickers Automated Systems Division has been appointed office manager at Mayfair office. Graeme Ridler, a sales executive with British Olivetti, has been appointed as a consultant also at the Mayfair office.

Also appointed at the company's Amsterdam office as a consultant is Andy Ellis. He was previously with Span Computer Consultants.

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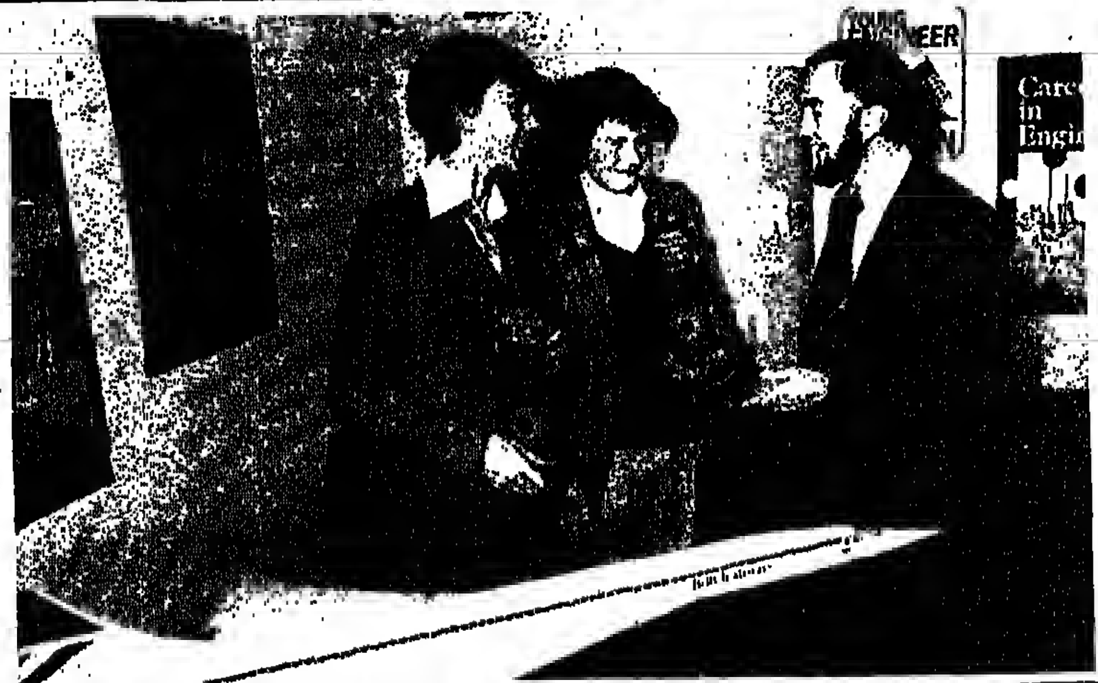


AMONG the sponsors of the first "Young Engineer for Britain" competition was consultancy SPL International. Competitors were required to manufacture innovative and commercially viable devices.

Our picture shows SPL director David Rodwey presenting prizes to Roger Curry (18), of Co Durham (left), who made a high-voltage generator, and Stuart McArthur (18), of Aylesbury (centre), whose entry was a light and heat control system for an aviary.

DIARY

SEPTEMBER 29
Annual dinner. O. A. Fisher, guest of honour. BCS Advanced Programming Specialist Group. Tickets £6.00 from Prof P. J. H. King, 10 Gower Street, London WC1. 19.30.
PL/I in a CMS environment. Tony Smith. BCS PL/I Specialist Group. LSE, London WC2. 17.30.

OCTOBER 4
CEO & computing present and future. BCS, Kent branch. St George Hotel, Chatham. 19.30.
Introduction to the Winter School. A historical view of processor development. Peter Ford, Dr R. N. Ibbett. BCS Nottingham branch. T1 Main Lecture Theatre, University of Nottingham. 19.00.
The minicomputer and its impact on commercial DP. Martin Healey. BCS First Time Users Group. Staff House, University of Birmingham. 14.30.

OCTOBER 4-6
Datafair 77, the end user, biennial conference. BCS. Cunard International Hotel, London W6. Details: Oyez-IBC Ltd, tel: 01-242 2481.

OCTOBER 5
The new ANS Fortran standard/The growth of preprocessors. BCS Fortran Specialist Group. Cunard International Hotel, London W6. 16.15.
PL/I, what's in it for you? C. Bird, P. G. Barker et al. BCS PL/I Specialist Group. Cunard International Hotel, London W6. 18.00.
CADE, computer-aided design and engineering in telecomms. Eddie Hunt. BCS South Essex branch. The Bulls Eye, Basildon. 19.45.

OCTOBER 5-6
Regional electronic instrument exhibition. Electronic Promotion Group/Industrial and Trade Fairs Ltd. Esso Hotel, Coventry.

OCTOBER 6
Computers in a law office. David Andrews. BCS Law Specialist Group. Polytechnic of Central London, London W1. 18.00.
The use of computers in the health services. BCS Medical (London) Specialist Group. Cunard International Hotel, London W6. 14.00.

OCTOBER 10
Computer time sharing services. IEETE. Manchester.

OCTOBER 11
Computing, the next twenty-five years. Dr Chris Evans. BCS Croydon branch. Fairfield Halls, Croydon. 19.15.
Databases, Codasyl and non-Codasyl. Basil Cousins. BCS, Reading branch. ICL Building, Bracknell, Berks. 20.00.
Speech recognition. Dr P. D. Green. BCS, North Staffs Branch. Royal Oak Hotel, Stafford. 20.00.

OCTOBER 12
The work of the Central Computer Agency. Reay Atkinson. BCS, Sussex branch. Old Ship Hotel, Brighton. 10.30.

SOCCER

Tops and bottoms

ALTHOUGH divisions two and three are tied up in the Summer Computer League, division one is still wide open. Gryphon is top, having 12 points from its eight games, but Jedpu and Lloyds, both having two games to play could still be champions.

Datascene ended the season in style with its eighth win in eight games to win division two. Xerox was second and Laur Puntar is already relegated.

ICL joined Altergo at the top of division three with a 7-1 defeat of British Rail. Altergo win on goal difference. The wooden spoon goes to KCS and BIS.

Latest results:

Division I
Comshare 5, Computing 0
FNS 5, Southwark 0
Gryphon 7, Comshare 0
Jedpu 3, Gryphon 2
Jedpu 4, Comshare 0
Lloyds 5, Southwark 0
SIA 5, Computing 0

Division II
Datascene 6, TSL 0
Lambeth 9, TSL 0

Division III
Airfix 5, British Rail 0
BIS 5, CDC 0
Datasolve 6, British Rail 0
Datasolve 5, CDC 0
ICL 7, British Rail 1

COURSES

LATEST in the BCS Datatalk series is Computers in Finance, a seminar offered by the BCS Marketing Committee on October 11 at the Café Royal, London. It will discuss, among other subjects, the future of electronic fund transfer and using computers in the Stock Exchange. Further information from Pauline Walters, BCS, 29 Portland Place, London W1N 4HU, tel: 01-637 0471, ext 52.

THIS autumn the Data Processing Management Association is holding a series of half-day seminars on management education. The first seminar, People in Groups, will be held on October 5 and they will run until December 7. Contributors are ICL, ASTMS, Which Computer?, Langton Information Systems and F International. The seminars will take place in central London on Wednesdays, 2.00 to 5.30 pm. Further information from DPMA, 27a York Road, Maidenhead, Berks SL6 1SQ, tel: 0628 20979.

A COURSE in mathematical programming offered by the Polytechnic of Central London will emphasise the computational aspects and applications of linear and integer programming, and will be held between 6.30 and 9.00 pm on Mondays, beginning on October [illegible] is £8.00 and enrolment is by [illegible] applications at PCL, 115 New Cavendish Street, London W1 on September [illegible] from 5.30 to 7.00.

A REPEAT of the course on application of production and [illegible] control will be held at the [illegible] Group training centre at [illegible] on October 3-7. The course [illegible] application of material [illegible] theory to practical production [illegible] inventory control problems [illegible] information from David Parker [illegible] 4411.

FOUR courses beginning in October [illegible] offered by the Urwick Management Centre at Slough. They are designed [illegible] the non-financial executive, October [illegible] general management, October 10-November 18, marketing management, October 10-26, and ICT [illegible] of contract, October 19-21. Further [illegible] from J. Swainson, Baylis House, [illegible] Poges Lane, Slough, SL1 3PF, tel [illegible] 34111.

THE 1977-78 brochure from [illegible] Systems is available and contains [illegible] of a wide range of courses [illegible] headings: User Involvement [illegible] appreciation, Cobol for [illegible] ming staff, etc); DP Skills [illegible] Systems and Programming Skills [illegible] base, and Real Time, Network [illegible] Distributed Intelligence; Management Skills in DP, sub-headed [illegible] Operations Management and [illegible] Management; and Business Skills [illegible] counting principles and [illegible] duction to operations research [illegible] Further details are obtainable [illegible]

HOW to Choose the Best Computer Systems is a one-week course for DP staff who have to evaluate [illegible] computer systems. It will show [illegible] define requirements and [illegible] select product alternatives, [illegible] negotiate contracts with these [illegible] course has been organised by [illegible] International and will be held [illegible] vember 21-25 in London. For [illegible] information contact Mike Edge [illegible] 32588.

COURSES in the [illegible] and [illegible] social surveys at the Polytechnic of [illegible] London are given jointly by the [illegible] ments of Mathematics and Applied [illegible] Studies in conjunction with the [illegible] Group on Computers in Survey [illegible] and the British Sociological Association Survey Research Group. The courses run consecutively, [illegible] one term. Their titles are [illegible] Elementary Survey Analysis [illegible] Survey Methods, and Advanced [illegible] cal Techniques in the Analysis of Surveys. Students can enrol [illegible] more of the courses.

Further details from the Department of Mathematics, Polytechnic of [illegible] don, Holloway Road, London [illegible] 01-607 2789, ext 2309.

COMPUTER WEEKLY
The following special supplements are due to be published during

OCTOBER
COMPUTERS IN THE OFFICE/ INTERNATIONAL BUSINESS SHOW
October 6

This year, the Business Efficiency Exhibition blossoms in brighter colours as the International Business Show, to be held in [illegible] from October 11 to 20.

By bringing small business man and the office manager face to face with new computer systems, the IBS could prove to be an important landmark on the way to the much heralded "automated office".

In the October 6 issue of Computer Weekly, there will be a comprehensive preview on what is to be on show at the IBS plus specially commissioned articles looking at the needs of the automated office and of the computer environment in general.

★ INTERNATIONAL EDITION - SYSTEMS 77 PREVIEW + Bonus Circulation
October 13

The biggest West German showcase devoted exclusively to computer systems and peripherals, Systems 77 takes place in Munich from October 17-21.

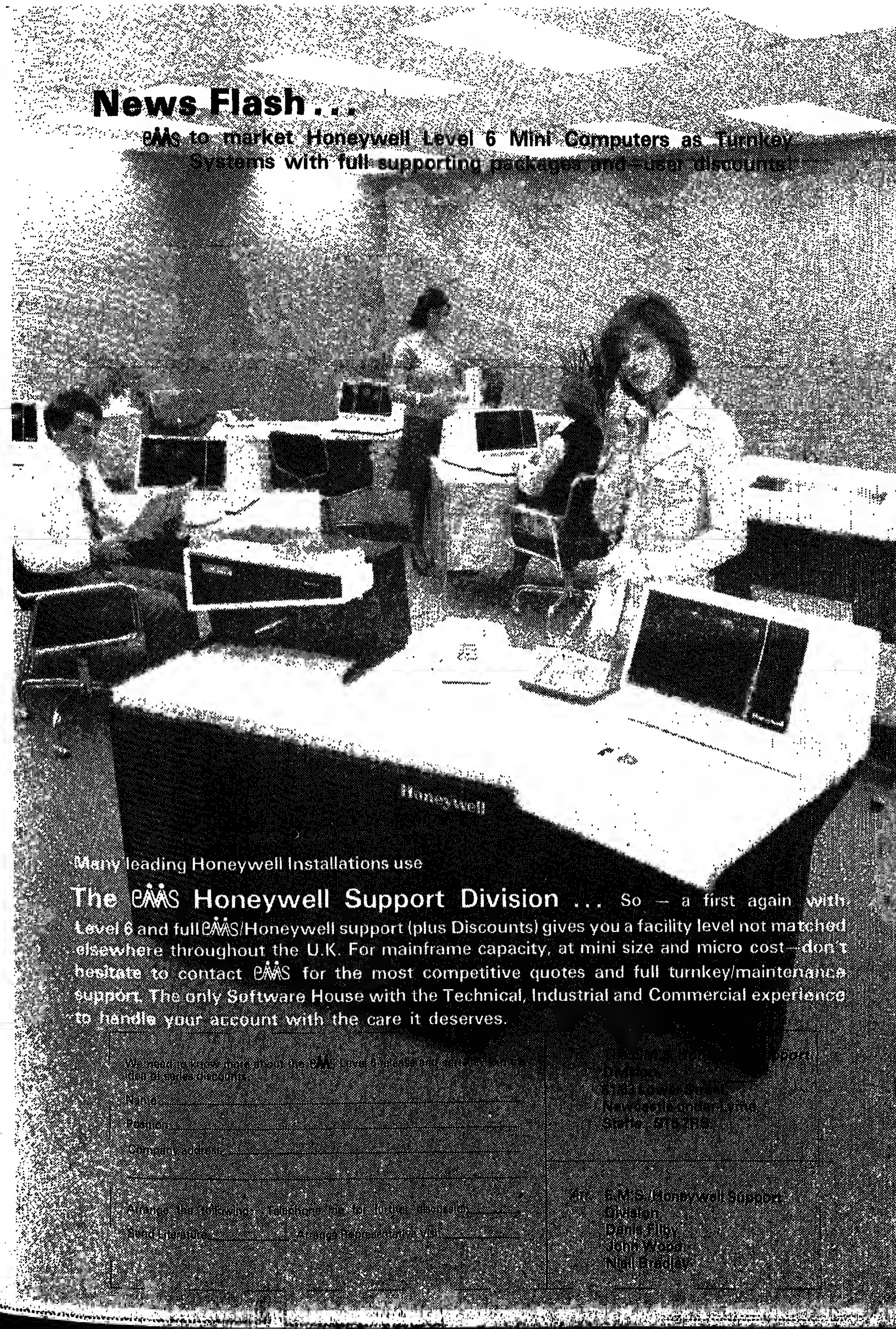
Once again, Computer Weekly is taking a stand at the show to offer advertisers an unrivalled means of reaching the large number of high-calibre visitors to the show. During the course of the exhibition 6,000 copies of the October 13 Computer Weekly [illegible] comprehensive preview of the exhibits on offer, and [illegible] computing in West Germany, will be distributed to visitors.

LONDON AND WESTERN
Stephen Measures 01-261 8293, Tony Kaminski 01-261 8[illegible], [illegible] Moore 01-261 8109, Lloyd Collins 01-261 8757.

MIDLAND
Ken Parrott 021-356 4838

NORTH AND SCOTLAND
Harry Aiken 061-872 421[illegible]

Stop Press: Computer Weekly continues to [illegible] recruitment advertising and has a higher [illegible] Bureau Circulation) of 76,08[illegible] than any other [illegible]
★ Additional 19,138 regular readers [illegible] INTERNATIONAL EDITION which is published [illegible] month excluding August and December.



LETTERS

Wanted—better concepts and designs for micros

I VERY much regret the attitude that Professor Dr E. W. Dijkstra and many other computer scientists are taking to the microcomputer.

Present-day microcomputers are ill-designed, inconvenient to use, and conducive of bad habits. And they will remain so, until the computer scientist takes his head out of the sand and recognises that he has a responsibility to do something about it.

The microcomputer is not a computer writ small. It is a new device presenting new design problems and challenges. Applying good computer practice to microcomputers is not adequate.

At Toronto, I had hoped to stimulate a debate on how the microcomputer could be developed; instead, I merely demonstrated that the computer fraternity has as many backwoodsman as any other group.

What is wanted are better concepts and designs for microcomputers and microcomputer languages.

Dijkstra . . . where are you?

ANN M. BARRON
Redbourne, Herts.

Comtech's move to Ireland

YOU published (CW, August 25) an article concerning the decision of the Canadian computer services company, Comtech, to locate its software developments office in Ireland. The final paragraph contained a small inaccuracy as Comtech, together with Allergo and MSP have been joined in Ireland by Infocom and Samsom Automatisering from Holland and by Zeus Hermes from the UK.

The Industrial Development Authority, which administers the scheme of industrial grants in Ireland, expects to approve financial support to further companies in the computer industry this year.

T. A. JONES
Service Industries Division
IDA Ireland.

Substantial rises in BCS subscriptions fear

TWO apparently innocuous resolutions are proposed as special business for the forthcoming annual general meeting of the British Computer Society. Members should not be deceived. These resolutions, if carried, could have a profound effect on the future of the Society. It is our belief, for example, that these resolutions will lead directly to substantial increases in subscriptions being proposed at next year's annual meeting.

Numerically, the Society's membership has been stagnating, and is now declining. The Beaumont Conference recognised that large numbers of computer professionals were outside the Society and that they should be encouraged to join. Hence the modifications of the rules governing entry. The Kingston branch, with the close co-operation of the Membership Board and the Branches Board, undertook a special recruitment project. Within the project, the branch is systematically identifying the membership potential in its area and will shortly test various recruitment techniques.

The Council registered 30,000 as its membership aim under the Companies Act. Such a figure would lead to a healthy financial position for some years, with current fees. We are more than 7,000 short of this target.

More of the qualified professionals currently outside the Society must be recruited. Will the new charges help? We think not. The proposed £5 application fee in particular is an anathema to us. Those of us who have sponsored many candidates for membership know what a lottery membership application is. It is surely immoral, and certainly unprofessional, to take an application fee from a candidate, pocket it, reject the application and then give no reason why!

It is not uncommon for established professional societies to charge an entrance fee. The BCS took powers in its articles of association to introduce such fees at the proper time. We believe this is not the proper time.

Members will have noted a net drop in the numbers of Fellows and Members during the year despite significant numbers of new entrants to these grades. The Membership Board chairman reported "500 ineffective members were removed from the register." Knowing some of the members personally, we can report that there was nothing ineffective about many of them. They made a positive contribution to the profession and to the Society. Their only [illegible] decision that the BCS [illegible] tion no longer [illegible] value for money [illegible] refusal to pay.

In these days of [illegible] stringencies, when [illegible] within the Society [illegible] pay their subscriptions [illegible] resi prospects are [illegible] persuading those [illegible] to pay double subscriptions [illegible] come in?

The Society's treasurer's report noted that the [illegible] was heading for a deficit [illegible] 1978/9. Subscriptions will [illegible] increases immediately, [illegible] members of the Society [illegible] being allowed one year's [illegible] If during this period we [illegible] sufficient new members [illegible] scription rates can be [illegible] Could we recruit enough [illegible] members if the special fees [illegible] resolutions are passed?

What is the case for [illegible] resolutions? In the forward [illegible] the president's foreword [illegible] annual report not one [illegible] point is made in favour of [illegible] resolutions. The treasurer [illegible] ignores them. Can we [illegible] there is no case in favour [illegible] these resolutions?

What can individuals [illegible] about this? We recommend [illegible] positive action.

Attend the annual [illegible] and vote against them. [illegible] If you cannot be present [illegible] complete your proxy [illegible] clearly indicating your [illegible] should be cast against [illegible] resolutions. When a [illegible] demanded your vote will [illegible]

For and on behalf of [illegible] committee of the [illegible] upon-Thames branch [illegible] British Computer Society [illegible]

D. R. L. [illegible]
Hon. Sec.

Ewell, Surrey.

Effect of micros on system design

THE comments by Dr Ted Glaser on the effect of microprocessors on system design (CW, September 15) give the impression that "the idea of optimisation" is on the way out. His example purported to demonstrate how the "classic computer design approach" can give the wrong results by using software means to get more out of hardware.

While I accept his case that designers can now afford to be more liberal in configuring the hardware, I do not accept his implied definition of optimisation, nor the classic computer design. Indeed, it seems to me that his misunderstanding of these concepts illustrates the attitudes to which Dr Dijkstra has taken such highly publicised exception.

Firstly, optimisation is not and never has been solely a question of getting as much as possible out of the hardware. Optimisation involves balancing a number of factors such as performance, maintainability, cost, etc to obtain the best practical system in the circumstances. The circumstances will vary according to the applications, user requirements, equipment available and so on. Granted [illegible] weight needs to be [illegible] hardware utilisation [illegible] that still leaves plenty [illegible] on.

Secondly, the design [illegible] which Dr Glaser describes [illegible] "classic" is anything but [illegible] since it concentrates [illegible] mechanics of the spec[illegible] ti-programming) [illegible] form (the system struc[illegible] the past, it is true that [illegible] and cost of the hardware [illegible] placed severe constraints [illegible] system designer, to the [illegible] that hardware was [illegible] mined system structure [illegible] than the other way round.

The designer was [illegible] completely free to [illegible] system structure when [illegible] cerning himself with [illegible] and characteristics of [illegible] ware, although cheap [illegible] micros will open up [illegible] options for him to consider, [illegible] danger is that the [illegible] cheap hardware will [illegible] into believing that [illegible] need to bother about [illegible] structure at all. As my [illegible] points out, that is [illegible] stood 25 years ago.

TONY [illegible]

Butler Cox and Partners
London W1.

The Editor welcomes letters [illegible] published in Computer Weekly; [illegible] letters must be accompanied by [illegible] address, not necessarily for [illegible]

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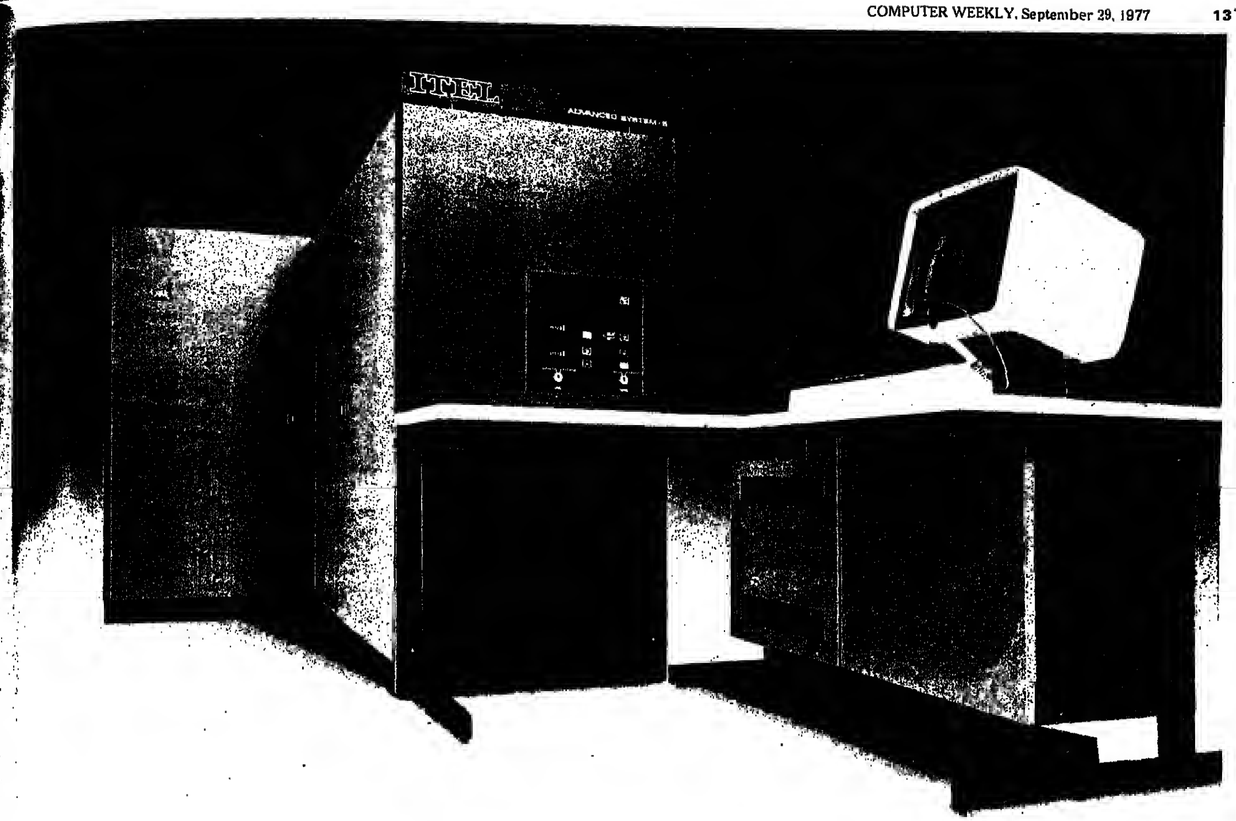

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COMPUTER OPPORTUNITIES IN SCOTLAND

The day Jock realised he was homesick . . .

By John M. Shaylor

John Shaylor, director of ATA Selection and Management Services, Edinburgh, takes an off-beat look at the Scottish jobs scene . . . through the eyes of a homesick Glaswegian.

CRAGGY 6' 3" Glaswegian DPM Jock MacCobol rose from his desk and strode across his office towards the window. He gazed blankly out at the falling snow.

After a while he shook his head and paced back to his desk, walked round it twice, feinted towards the door then changed his mind and sat down, took out his pen, put it back, stood up, drank the tepid remains of his coffee, scratched his chin and sighed a deep Scottish sigh.

Jock was definitely not himself these days, his work was not up to his usual high standard, and his golf was all to pieces. Something was wrong, but what? Haran his fingers through his hair and began to analyse the problem for the umpteenth time.

"After all," he reasoned, "I have all I need in conventional material terms. Ststistically I'm a success: DPM with a national insurance firm at 34; lovely wife and 2.4 kids; delightful suburban residence only 85 minutes from the office; I anjoy my job; I've no ambitions to sail round the world, grow my own vegetables with a bunch of hippies or write the Great British Novel. I've no skeletons in the typing pool. Whot tha hell is the matter with me?"

The phone shrilled. He picked it up and found himself talking to o Scottish contact he'd baen trying to locate all day.

"Is that you, Alec?" he rasped irritably. "Whare the hall have you been? Have you sent that information? I must have it tomorrow."

Alec's voice came back faintly. Pathetically, he answered: "Aye, I've sent it, and dinna shout, mon . . . ah'm atill getting over Hogmanay."

Jock put the phone down, he reflected on his own Hogmanay — a few drams and a tin of shortbread biscuits with the neighbours. And that was it. No firat-footing, no parties . . . nothing.

And then it hit him. With a blinding flash of insight, Jock realised he was homesick!

He leaped to his feet, strewing papers over the floor, and produced a Highland whoop of triumph that froze the typing pool two floors below. A confused blur of images flashed through his mind . . . Jock powering his imparious woy round Turnberry, Jock the Cairngorm ski star, Jock the Highland laird picking off the grouse . . . Aye, that's the life . . .

Two doys later he tracked down a friand, a recruitment consultant who spacialised in computer staff. They met in a pub, and after a couple of drinks Jock came to the point.

"What sort of prospects would I have back home?"

"Well, since you left things have certainly changed. Economically Scotland is a very different proposition today and this is reflected in the growth of the use of computers, and naturally in the demand for computer personnel."

"Is that so? I thought most of tha big outfits there would be subsidiaries using London head office hardware."

"Absolutely not. A lot of the big companies have their installations in Scotland now."

Jock peered into his whisky and thought for a moment.

"Does this mean that computer staff don't have to leava Scotland to get promotion?"

"That's right. Prospects are as good thare as anywhare, probably better."

"Hmm. You know I'm a DPM for an insurance company at tha moment. What are the chances?"

"Generally pretty good, although of course management jobs don't grow on trees. However, many departments are actiyaly increasing in size, therefore there is a large damand for experienced personnel across the board."

"And where would these jobs be?"

"Oh, tha whole financial/insurance/banking sector is based in Edinburgh, with a few exceptions, while the manufacturing industry tends to concentrate in tha West, around Glasgow. Outside these two areas there are opportunities, but they tend to be fairly few and far between."

"Och, that's a shame. I'm a Glaswegian myself and I can't say I like tha idea of moving to Edinburgh."

His friend laughed.

"I thought you might say that, but in practice it isn't a problem."

"How's that?"

"Because you could live in Glasgow and travel to Edinburgh as quickly and as easily as it would take you to make a relatively short journay in London. Communications generally are very good."

"Well, that sounds encouraging."

"However, I must say it would be a lot easier if you were still a programmar."

"Why's that, then?"

"Because there's a distinct lack of good programmers in Scotland — they're ilka gold dust."

"Is that so?"

"Yes, and tha situation isn't improving — there seems to be an aver increasing demand for good progs — some companies are avan offering immediate cheap mortgages to lure them up."

"Well, that doesn't sound too bad then, and what'a the scene ilka for othar jobs, you know — analysts, analyst progs, operators, and so on?"

"On the whole not bad you see, the DP industry in Scotland is going through a boom period at the moment, although I must say it's more difficult to fix up operators."

"Why's that?"

"Don't really know — maybe because a lot of the big companies, banks etc, train them up and then make sure they don't want to leave . . . hence not much movement."

Jock took another sip from his whisky, lit a cigarette and considered.

"What about expenaes for interviews, house removals, all that stuff . . . bet companies aren't too keen to have to fork out for all that, especially if they're 'Scottish!'"

"Well, most of them are pretty good, but obviously they've got to be really interested, and won't ask you for an interview just so you can visit your relatives! No, seriously they're pretty realistic, and if they want you are quite happy to make the investment — after all, they're thinking of the future."

"Is that right? Hmm. What about housing than?"

"I won't pretend the place is a bargain hunter's paradise. Soma areas ore very pricey, but on the whole Scottish prices nre competitive, particularly as you can live outside the conurbations and travel relotively easily. And in your business, thot is, Inaurance/finance, you have an excellent chonce of a mortgage subsidy."

"What sort of responaa do you get for Scottish vacancies?"

"Quite good. Thare has been a marked build up, especially for tha management jobs. Funnily enough from expatriates. I think it must be somathing to do with a general increase in confidence in the future of the country."

"Aye, or maybe the prospect of qualifying for the World Cup!"

Jock glanced at his watch and a look of sheer panic spread over his face. Hurriedly ha downed his drink and sprang to his feet, then just as suddenly he relaxed in mid-spring and sat down with a sheapish grin.

"Sorry about that," he said. "It's just that even though I've been in London all this time I still can't get used to pubs staying open after 10 o'clock."

"Ah well, in that case you'll be doubly glad to get backhoma. They're open till 11 now up thara."

"What?"

"They've changed the Scottish licensing laws it's 11 now."

Jock's jew saggad. "That does it. Get me a job, I'm going home!"

"Jock leaped to his feet, strewing papers over the floor, and produced a Highland whoop of triumph that froze the typing pool two floors below."

NCR

SENIOR SYSTEMS ANALYST ANALYST/PROGRAMMERS

Tha Management Information Servicas Department at NCR, Dundee, haa vacancies for a Senior Systams Analyat and aevaral Analyst/Programmers.

Tha Department supplies tha data processing needs of the manufacturing organisation, utilising an NCR Century 300 computer with 896K byte memory and a host of peripharals including an expanding VDU network. Applications covar all areas of production control, administretion and finance and tand to ba technically advanced so that auccassful applicents ara assured of involvement in up-to-date mathodologies.

Tha aenior poaition raquiras somaona with at laast six years ralevant exparience, some of which will idaally hava baan in a manufacturing anvironment and who can indicata qualitias of initiative, anargy, an orgenised approach and an overall dadication to maating planned objectives.

Selected applicants for the Analyst/Programmar positions will have four or more years' programming experiance principally in COBOL and some experiance of systems analysis.

For both job categorias, experienca in any of tha following will provean added advantage: onlina deaign or programming, TOTAL datsbase management software, or proprietary package implamentetion.

In addition to attractiva aalaries, the conditions of amployment include a 35 hour waak for all positions (which are opan to both man and women); tha possibility of paid overtime; pansion and life assurance schemes; subsidised catering facilities and ganarous relocation aaaistance.

In the first instance, please writa giving full caraar and personal details to:

Ian Huma,
Personnel and Employee Relations,
NCR Manufacturing Divialon,
Kingswey Wast,
Dundee DD2 3XX

SECURITY AND STANDARDS SUPERVISOR

DATA PROCESSING

PAISLEY

We are one of the leading Scotch Whisky Companies and are part of the largest liquor organisation in the world. In our Data Processing Department we use a 370/135 144K with 3330s using a DOS VS (power) Operating System and a Duplex MDS 1200 KOS Data Entry System.

Applicants, of either sex, must have at least 3 years' experience of data processing including a minimum of 2 years' in programming/systems analysis and 6 years' in operations. A thorough knowledge of 370 hardware using DOS VS (power) is mandatory and a knowledge of all data processing functions would be of considerable advantage.

The function is to develop and maintain operations of security procedures and standards of advice on the operational techniques of new systems and to take part in the change-over of new or revised jobs during implementation and parallel running to live operation.

This is an ideal stepping stone to Operations Management for a person currently in a supervisory position.

An attractive salary will be paid and the fringe benefits are excellent.

Initial brief, written applications should state age, qualifications, and experience and should be addressed to the Group Employee Services Manager at the address below:

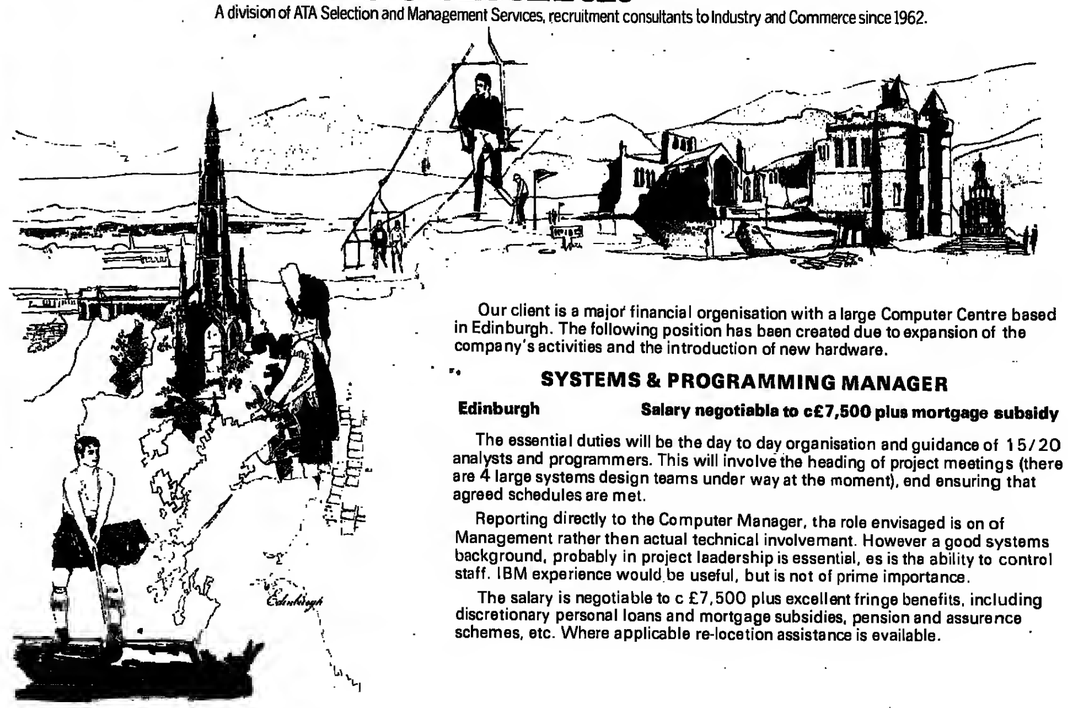
CHIVAS BROS. LIMITED
111/113 Renfrew Road
PAISLEY PA3 4QY SCOTLAND

FURTHER APPOINTMENTS APPEAR ON PAGES 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47

ata

Computer Recruitment in Scotland.

A division of ATA Selection and Management Services, recruitment consultants to Industry and Commerce since 1962.



Our client is a major financial orgenisation with a large Computer Centre based in Edinburgh. The following position has been created due to expansion of the company's activities and the introduction of new hardware.

SYSTEMS & PROGRAMMING MANAGER

Edinburgh **Salary negotiabla to c£7,500 plus mortgage subsidy**

The essential duties will be the day to day organisation and guidance of 15/20 analysts and programmers. This will involve the heading of project meetings (there are 4 large systems design teams under way at the moment), end ensuring that agreed schedules are met.

Reporting directly to the Computer Manager, tha role envisaged is on of Management rather then actual technical involvement. However a good systems background, probably in project leadership is essential, es is the ability to control staff. IBM experience would be useful, but is not of prime importance.

The salary is negotiable to c £7,500 plus excellent fringe benefits, including discretionary personal loans and mortgage subsidies, pension and assurence schemes, etc. Where applicable re-locetion assistance is available.

Our client is a large volume manufacturer of complex engineering products, based in Central Scotland.

The Company has a very broad based expansion programme in Scotland, and requires to extend its syateme facilities in perallel with this growth. A large IBM computer facility will be installed early in the New Year es the first step in this development.

These changes will craate the following job opportunities.

COMMERCIAL SYSTEMS MANAGER
c £7500+Car

The Commercial Systems Manager will be responsible for all systems developments in the accounting/commercial functions of the business. You should be capable of analysing the Users problems and judging the most suitable role of DP in their solution. You must have the personality and professional standing to sell your solution to the User and the management capability to bring it to a successful implementation.

The selected candidate will preferably have had a formal accountancy training. Applicants must have 4/5 yeers DP experience, have implemented at least one major project, and have sufficient programming background to make eound technical decisions. Some database experience would be useful.

PROGRAMMING MANAGER
c £7500+Car

The Programming Manager will be responeible for training and developing all programming staff.

You will have overall reeponsibility for departmental programming etandarde which will conform to the beet current practices in etructural programmlng.

You will have functional responsibility for all programming activity some of which will take place in project teams.

The successful candidate will have a minimum of 4 years programming experience and have proven management abillty. Applicants must hava a developed view of programming methodology and the technical strength and personality to lead the department to accept their views.

PROJECT SUPERVISOR/ BUSINESS SYSTEMS ANALYST
£4500 - £6500+Car

We wish to fill a number of positions with candidates capabla of managing the development of reasonable aized projects or working as senior members of large project teams.

The succeesful applicants muat have a minimum of 3 years DP experience involving meaningful programming exposure, sonie knowledge of database techniques would be advantageous.

All positions are open to male and female applicants, provide contributory pension scheme, and generous additional benefits including comprehensive relocation assistance where required.

For further details telephone our Edinburgh office, 031-226 5381 or your nearest ATA branch. Written applications enclosing detailed Curriculum Vitae to: ATA COMPUTER RECRUITMENT, Anglia House, 24/26 Frederick Street, Edinburgh EH2 2JR

LONDON (01) 837 0781 · BIRMINGHAM (021) 643 1994 · BRISTOL (0272) 211035 · MANCHESTER (061) 832 5887 · CRAWLEY (0293) 514071

The British National Oil Corporation

TECHNICAL ANALYSTS

BNOC (Development) Ltd., is the operating company of BNOC responsible for the successful development of the Thistle Field. Extensive use must be made of computing resources to support the engineers and petroleum engineering groups working on this.

A technical computing group has been formed and two Technical Analysts, initially London based, are required urgently. These are demanding, ground floor appointments in an expanding organisation. Current computing needs are being met through the use of bureaux machines, while the future requirements of the Corporation are under active consideration.

Applicants should be able to offer some of the following:

- education to degree level or equivalent
- at least 4-5 years' relevant D.P. experience in a technical computing group
- experience of applications in structural engineering and reservoir engineering
- significant experience of FORTRAN
- good working knowledge of OS/JCL

Salaries for these posts are competitive and associated conditions of employment are excellent.

Please write or telephone for an application form quoting reference TA/CW to:

The Recruitment Manager,
The British National Oil Corporation,
150 St. Vincent Street,
Glasgow G2 5LJ,
Telephone 041-204 2525.

BNOC

British National Oil Corporation

FINANCE Computer Control

The Corporation has an opening for a personal section head level in this sub-section of the Finance Division in Glasgow. The post entails:

1. Monitoring the control of all commercial computer systems which will be updated directly by accounting units based in London, Aberdeen and Glasgow.
2. Establishing and ensuring the achievement of deadlines.
3. Resolving any problem identified by the control procedures.

The successful candidate, while not necessarily having formal qualifications, should have a strong accounting background, and extensive D.P. control experience gained either in an internal audit or operational environment.

The salary for the post is very competitive and associated conditions of service are excellent.

Please write or telephone for an application form quoting reference CDIC/C to:

The Recruitment Manager,
The British National Oil Corporation,
150 St. Vincent Street,
Glasgow, G2 5LJ
Telephone: 041-204 2525

BNOC

British National Oil Corporation

COMPUTER TERMINAL OPERATORS

The Corporation has Ventek Datapoint 5500 computer terminal equipment in Glasgow and London which is used for processing both technical and commercial applications. Each system includes disk storage, visual display screens, card reader and fast line printer. The Venteks are used for simultaneous data capture and remote batch processing. The principal emulator used is IBM HASP/20 work station but others include IBM 3780 and Univac 1004.

Two Computer Operators are required for each of our Glasgow and London terminal operations group.

Successful applicants should have:

- education to 'O' level in at least four subjects including English and Mathematics.
- at least 1-2 years relevant D.P. experience
- experience of IBM OS JCL
- experience with telecommunications equipment
- experience of dealing with users

A two shift system will be worked and shift allowance will be allied to a competitive salary and attractive conditions of service.

Please write or telephone for an application form quoting reference CTO/CW to:

The Recruitment Manager,
The British National Oil Corporation,
150 St. Vincent Street,
Glasgow, G2 5LJ
Telephone: 041-204 2525

BNOC

TPS ONLINE SYSTEMS: £3-5 ½ K

PROGRAMMERS

(Minimum 1 year ICL)

SENIOR PROGRAMMERS

SYSTEMS ANALYSTS

LECTURERS (SOFTWARE)

TELECOMPUTING

SPECIALISTS IN ONLINE TRANSACTION PROCESSING SYSTEMS

OXFORD LONDON AMSTERDAM

Telecomputing is established as the expert supplier of online systems for ICL computers. TPS is the world's leading tp monitor software on this range.

Our continuing success and outstanding growth means we need more people to work on client projects in London and U.K. and international locations but particularly at our Oxford offices.

IF YOU HAVE ONLINE SYSTEMS EXPERIENCE OR WISH TO ACQUIRE IT

WRITE OR PHONE:

TELECOMPUTING, SEACOURT TOWER, WEST WAY, BOTLEY, OXFORD (0865) 723621

COMPUTER OPPORTUNITIES IN SCOTLAND

UNIVERSITY OF STSATHCLYOE

Applications are invited for a

RESEARCH FELLOWSHIP (PROGRAMMER)

in the ARCHITECTURE AND BUILOING AIDS COMPUTER UNIT, STRATHCLYDE (ABACUS) in the DEPARTMENT OF ARCHITECTURE AND BUILDINO SCIENCE. The Unit is engaged in research and development of applications software for the architectural and building professions.

Candidates should possess a degree or equivalent qualification. Experience in the development of CAO Software (FORTRAN) particuarly on DEC 10 and/or DG NOVA computers, and in graphics, would be of considerable advantage.

Appointment initially until 28th February, 1981. Commencing salary within the scale £3,781 - £4,807 per annum on Range IA of the national salary structure for research and analogous staff, with placing according to qualifications and experience.

Further particulars and application forms (quoting R14/77) may be obtained from Professor T. W. Maver, Department of Architecture and Building Science, Architecture Building, 131 Rottenrow, Glasgow G4 ONG with whom applications should be lodged by 5th October, 1977.

GREATER GLASGOW HEALTH BOARD COMPUTER CENTRE

Computer Programmer

Grade 1

Salary Scale £3153-£4038 (inclusive of Phases I and II)

Applications are invited from Programmers with a minimum of one year's practical experience programming in Cobol. A background in any of the following would be an advantage:

1) Financial or Administrative Applications
2) Knowledge of ICL equipment
3) Knowledge of Filetab or FTL6

Application form and further details may be obtained from the Personnel Officer, Greater Glasgow Health Board, 351 Sauchiehall Street, Glasgow G2 3HT to whom completed forms should be returned no later than Monday, 3 October 1977.

More than just a living, more a way of life.

Too often in this hurly-burly world, life is divided into two separate areas–your job and your recreation–with no link between them. At NCR we combine the best of both worlds.

At our unique location on the coast close to all the premier Scottish golf courses, with motorway links to Edinburgh and Glasgow, and with the ski slopes on the horizon we can offer a quality of life second to none. And we offer stimulation at work–our innovations in computer technology are rapidly being acknowledged in the data processing world.

To maintain our pace of development we need new computer specialists, qualified to degree standard, in:

Basic Software Design

The people we require will have some experience in assembly level programming and in one or more of the following areas:-

- Programmatic control of electromechanical devices
- Diagnostic programming
- Mini/microcomputer operating systems
- I/O drivers
- Transaction programming languages

The rewards with NCR, in addition to high job involvement and excellent social amenities, include negotiable salary, 35 hour week, with the possibility of paid overtime, pension and life assurance schemes, subsidised catering facilities and generous relocation assistance.

In the first instance, please write giving full career and personal details to:–

Ian Hume,
Personnel & Employee Relationa,
NCR Manufacturing Division,
Kingaway West,
DUNDEE DD2 3XX.

NCR

BOWMAKER (PLANT) LTD.

Bowmaker (Plant) Ltd. is a Major Sales Service Organisation for Caterpillar Earthmoving Equipment.

We require

AN ADDITIONAL COBOL PROGRAMMER

with at least 2 years' relevant experience to work on a Honeywell 2050 (192K) which has communications facilities provided by a Datanet 2000 front end processor.

The work is varied and interesting. We are currently extending an on-line stores issue system which is scheduled for rapid expansion over the next few months eventually leading to a full real time stock control system.

Additionally we are developing on-line systems for processing other applications using TOTAL DATABASE.

Honeywell experience including communications experience though an advantage is not essential. Salary negotiable.

Please write or telephone for an application form to:

The Personnel Manager
Bowmaker (Plant) Ltd.
Watling Street, Cannock
Tel: Cannock 2551

PROGRAMMER

IBM SYSTEM 3

The Dunn & Wilson Group Ltd. has a vacancy for a Programmer to undertake a range of projects in the continuing development of the Company's operations.

The Group is a leading company in the library supply and bookbinding industry and is shortly to upgrade its computer installation to a cardless System 3 model 15 for the introduction of on-line applications.

The successful applicant is likely to be in the 20/25 age bracket with at least two years' programming experience.

Write with curriculum vitae to

Mr. L. J. Wolfe, MACA, The Dunn & Wilson Group Ltd. Earls Road, Grangemouth, Stirlingshire FK3 8XE

COMPUTER OPERATIONS MANAGER

Scotland up to £7200

Based at Regional Headquartera in Edinburgh. You will be reaponaible to tha Manager, Computer Servicea for the planning, organisation and day-to-day control of the Computer Oparationa Department which also includea job asaembly and data preparation.

Tha Computer Operations Departmant providaa a service to all functions within the Organisation and there la a haavy workload in both batch procesaing and on-line computar systema.

Tha hardware compriaes a 192K ICL 1904S baoked by a 128K 1903T with EDS 80, local VDU's and 7502 terminals with an IBM 1287 document reader and two ICL kay-to-dlac systams for deta preparation.

The post is a challenging ona and requires a matura individual with good organising ability, tha ability to control a large etaff and a sound knowledge of computer hardware and operating procedures. The salary scala la £5688-£6888 plua £312 Flat Rata Supplament.

Applications (from males and females), in writing, stating age, axperience and qualifications should be sent to:

Appointments Officer
SCOTTISH GAS
Granton House, West Granton Road
Edinburgh EH5 1YB
Closing date for applications:
Octobar 10, 1977.

SCOTTISH GAS

LOTHIAN HEALTH BOARD, EDINBURGH

PROGRAMMER

Scale 1: £3153 - £4038 or
Scale 4: £4038 - £4884
(Including Phase I, Phase II Supplements)

The Computer Services Unit has a vacancy for a Programmer to work on medical, financial and administrative systems. Applicants should have a background of COBOL programming experience, preferably on an ICL 1900.

The Unit is located at Board Headquarters in central Edinburgh and operates an ICL 1903T with tape and disc backing store, running under the George 2 operating system. The NCC's FILETAB and FTL6 packages are in use. Programme development is being switched from batch to on-line working, using the MAXIMOP system.

Experience in any of these areas would be a further advantage to candidates as the salary scale of appointment will depend on the length and relevance of the successful applicant's experience.

For further details and application form apply to the Personnel Officer, 11 Drumsheugh Gardens, Edinburgh EH3 7QQ, to whom forms must be returned by Friday, 14th October, 1977, quoting reference LHB 0208.

COMPUTERS S. & P. (GLASGOW) LIMITED

require

EXPERIENCED SYSTEMS ANALYSTS/ PROGRAMMERS

to be based in our Glasgow and Edinburgh offices. Excellent salary and working environment.

Apply in writing to:

Miss Gilmour
20 North Claremont Street
Glasgow G3 7LE

FUTUREVIEW

This week we begin a new, occasional series, FUTUREVIEW. In which contributors will try to provide a reasoned glimpse of future developments in computer technology and the impact upon society of computers and related technologies. To start the series, we are asking for your view of the future. Psychologist and computer scientist Dr Christopher Evans, who devised the questions and who will analyse the results, introduces this Computer Weekly Survey of your Futureview.

Delphic taste of the fast-changing future

Chris Evans

THE rapid pace of development in computer technology is now beginning to leave behind even the "experts". No sooner has one got over the surprise of the latest information about reductions in cost or size than one is hit by an unexpected hardware development or systems application which would have been undreamt of even five years ago.

Despite the apparent hopelessness of attempting to predict future developments in a field of science which is undergoing change at a rate which has never been seen before, it is better to make at least some effort at plotting the future, and thereby cushion oneself to some degree from its shocks and surprises, instead of sitting back aghast and allowing it to wash over one.

But where does one get one's guidelines for Future Maps if the "experts" and professional crystal gazers are themselves so frequently taken by surprise? One possible approach is to use the technique of Delphic Polling, a method first employed by the Rand Corp in the US, a decade or so ago in an attempt to predict the consequences of a pre-emptive Soviet nuclear strike.

Delphic polls are named after the Oracle of Delphi who offered traditionally ambiguous predictions to the Kings of ancient Greece.

The polls are nothing more than the collective opinion of a number of "experts" who have all answered an identical questionnaire inviting them to predict the most likely date on which they believe various future events will occur.

The pooled results, corrected to eliminate extreme views, can be plotted in a graphical form which allows a quick appreciation of the overall consensus of belief, including the most likely date by which the group believe the event will have occurred.

Delphic Polls have been employed, with some, but not inarguable, success in a number of areas of science and technology, economics and politics, but rarely in the field of computers.

The first mass public Delphic poll in the UK — possibly in the world — was conducted at the Build Your Own Computer Conference organised by Online in London earlier this year. The results were published exclusively in Computer Weekly.

That poll aroused such interest that Computer Weekly is now launching its own follow-up, aimed at a wider audience. For the larger the number of participants in a Delphic Poll, the better the results should be.

It will only take a few minutes to complete the form. Please do so. The results will give a fascinating and revealing picture of how computer professionals view their own expanding, but uncertain future.

Before making your forecast read these instructions

Do not fill in any part of the questionnaire until you have read these instructions carefully. Please also make sure that you fill in the poll on your own, without having first discussed it with a friend or colleague. It is important that the predictions you make are based on your own beliefs about the future, and not on what you feel other people believe about it!

Twenty one possible developments in computing are listed below. We would like you to think about each in turn and try to predict when it is likely to occur, if ever. As there can obviously be no certainty about predictions of this kind, all that is required is a rough guess of the nearest year, based on what seems to you most likely.

To make your prediction just place a cross in the box for the year you choose. If you think the development will come after the year 2000 or never, please put a cross in the appropriate box. But remember, do not discuss the poll with anyone before you have completed your answers.

Send your completed questionnaire to:
Dr Christopher Evans,
Futureview,
PO Box 17,
Teddington TW11 0NF,
Middlesex.

1. Complete hand-held computer, including mass memory and peripheral interfaces, equivalent in power to a 370/148.
1977 ☐ 1978 ☐ 1979 ☐ 1980 ☐ 1981 ☐ 1982 ☐ 1983 ☐ 1984 ☐ 1985 ☐ 1986 ☐ 1987 ☐ 1988 ☐ 1989 ☐ 1990 ☐ 1991 ☐ 1992 ☐ 1993 ☐ 1994 ☐ 1995 ☐ 1996 ☐ 1997 ☐ 1998 ☐ 1999 ☐ 2000 ☐ After 2000 ☐ Not

2. Computer-based shopping service available using domestic TV.
1977 ☐ 1978 ☐ 1979 ☐ 1980 ☐ 1981 ☐ 1982 ☐ 1983 ☐ 1984 ☐ 1985 ☐ 1986 ☐ 1987 ☐ 1988 ☐ 1989 ☐ 1990 ☐ 1991 ☐ 1992 ☐ 1993 ☐ 1994 ☐ 1995 ☐ 1996 ☐ 1997 ☐ 1998 ☐ 1999 ☐ 2000 ☐ After 2000 ☐ Not

3. Most software development undertaken by computers, ie automatic programming.
1977 ☐ 1978 ☐ 1979 ☐ 1980 ☐ 1981 ☐ 1982 ☐ 1983 ☐ 1984 ☐ 1985 ☐ 1986 ☐ 1987 ☐ 1988 ☐ 1989 ☐ 1990 ☐ 1991 ☐ 1992 ☐ 1993 ☐ 1994 ☐ 1995 ☐ 1996 ☐ 1997 ☐ 1998 ☐ 1999 ☐ 2000 ☐ After 2000 ☐ Not

4. Most major government decisions based primarily on computer modelling or computer predictions.
1977 ☐ 1978 ☐ 1979 ☐ 1980 ☐ 1981 ☐ 1982 ☐ 1983 ☐ 1984 ☐ 1985 ☐ 1986 ☐ 1987 ☐ 1988 ☐ 1989 ☐ 1990 ☐ 1991 ☐ 1992 ☐ 1993 ☐ 1994 ☐ 1995 ☐ 1996 ☐ 1997 ☐ 1998 ☐ 1999 ☐ 2000 ☐ After 2000 ☐ Not

5. Widespread use of computers for language translation.
1977 ☐ 1978 ☐ 1979 ☐ 1980 ☐ 1981 ☐ 1982 ☐ 1983 ☐ 1984 ☐ 1985 ☐ 1986 ☐ 1987 ☐ 1988 ☐ 1989 ☐ 1990 ☐ 1991 ☐ 1992 ☐ 1993 ☐ 1994 ☐ 1995 ☐ 1996 ☐ 1997 ☐ 1998 ☐ 1999 ☐ 2000 ☐ After 2000 ☐ Not

6. Average working week reduced to 20 hours due to advances in robotics and widespread use of automation.
1977 ☐ 1978 ☐ 1979 ☐ 1980 ☐ 1981 ☐ 1982 ☐ 1983 ☐ 1984 ☐ 1985 ☐ 1986 ☐ 1987 ☐ 1988 ☐ 1989 ☐ 1990 ☐ 1991 ☐ 1992 ☐ 1993 ☐ 1994 ☐ 1995 ☐ 1996 ☐ 1997 ☐ 1998 ☐ 1999 ☐ 2000 ☐ After 2000 ☐ Not

7. Postal services largely replaced by communications between word processors.
1977 ☐ 1978 ☐ 1979 ☐ 1980 ☐ 1981 ☐ 1982 ☐ 1983 ☐ 1984 ☐ 1985 ☐ 1986 ☐ 1987 ☐ 1988 ☐ 1989 ☐ 1990 ☐ 1991 ☐ 1992 ☐ 1993 ☐ 1994 ☐ 1995 ☐ 1996 ☐ 1997 ☐ 1998 ☐ 1999 ☐ 2000 ☐ After 2000 ☐ Not

8. Traditional magnetic memories, such as tapes and discs, almost completely replaced by solid state devices.
1977 ☐ 1978 ☐ 1979 ☐ 1980 ☐ 1981 ☐ 1982 ☐ 1983 ☐ 1984 ☐ 1985 ☐ 1986 ☐ 1987 ☐ 1988 ☐ 1989 ☐ 1990 ☐ 1991 ☐ 1992 ☐ 1993 ☐ 1994 ☐ 1995 ☐ 1996 ☐ 1997 ☐ 1998 ☐ 1999 ☐ 2000 ☐ After 2000 ☐ Not

9. Widespread use of microprocessors in the home, controlling lights, washing machines, security, etc.
1977 ☐ 1978 ☐ 1979 ☐ 1980 ☐ 1981 ☐ 1982 ☐ 1983 ☐ 1984 ☐ 1985 ☐ 1986 ☐ 1987 ☐ 1988 ☐ 1989 ☐ 1990 ☐ 1991 ☐ 1992 ☐ 1993 ☐ 1994 ☐ 1995 ☐ 1996 ☐ 1997 ☐ 1998 ☐ 1999 ☐ 2000 ☐ After 2000 ☐ Not

10. Widespread use of computers in cars to control major functions, such as autopiloting.
1977 ☐ 1978 ☐ 1979 ☐ 1980 ☐ 1981 ☐ 1982 ☐ 1983 ☐ 1984 ☐ 1985 ☐ 1986 ☐ 1987 ☐ 1988 ☐ 1989 ☐ 1990 ☐ 1991 ☐ 1992 ☐ 1993 ☐ 1994 ☐ 1995 ☐ 1996 ☐ 1997 ☐ 1998 ☐ 1999 ☐ 2000 ☐ After 2000 ☐ Not

11. Commercially available voice-controlled typewriters.
1977 ☐ 1978 ☐ 1979 ☐ 1980 ☐ 1981 ☐ 1982 ☐ 1983 ☐ 1984 ☐ 1985 ☐ 1986 ☐ 1987 ☐ 1988 ☐ 1989 ☐ 1990 ☐ 1991 ☐ 1992 ☐ 1993 ☐ 1994 ☐ 1995 ☐ 1996 ☐ 1997 ☐ 1998 ☐ 1999 ☐ 2000 ☐ After 2000 ☐ Not

12. Major advances in machine intelligence research leads to computers with consciousness and self-awareness.
1977 ☐ 1978 ☐ 1979 ☐ 1980 ☐ 1981 ☐ 1982 ☐ 1983 ☐ 1984 ☐ 1985 ☐ 1986 ☐ 1987 ☐ 1988 ☐ 1989 ☐ 1990 ☐ 1991 ☐ 1992 ☐ 1993 ☐ 1994 ☐ 1995 ☐ 1996 ☐ 1997 ☐ 1998 ☐ 1999 ☐ 2000 ☐ After 2000 ☐ Not

13. Widespread use of teaching programs for children and adults on home terminals.
1977 ☐ 1978 ☐ 1979 ☐ 1980 ☐ 1981 ☐ 1982 ☐ 1983 ☐ 1984 ☐ 1985 ☐ 1986 ☐ 1987 ☐ 1988 ☐ 1989 ☐ 1990 ☐ 1991 ☐ 1992 ☐ 1993 ☐ 1994 ☐ 1995 ☐ 1996 ☐ 1997 ☐ 1998 ☐ 1999 ☐ 2000 ☐ After 2000 ☐ Not

14. Five Megabyte store with random access time less than 100ms available for less than £100 (present prices).
1977 ☐ 1978 ☐ 1979 ☐ 1980 ☐ 1981 ☐ 1982 ☐ 1983 ☐ 1984 ☐ 1985 ☐ 1986 ☐ 1987 ☐ 1988 ☐ 1989 ☐ 1990 ☐ 1991 ☐ 1992 ☐ 1993 ☐ 1994 ☐ 1995 ☐ 1996 ☐ 1997 ☐ 1998 ☐ 1999 ☐ 2000 ☐ After 2000 ☐ Not

15. Direct connection between microprocessor and human brain or nervous system to improve human capabilities.
1977 ☐ 1978 ☐ 1979 ☐ 1980 ☐ 1981 ☐ 1982 ☐ 1983 ☐ 1984 ☐ 1985 ☐ 1986 ☐ 1987 ☐ 1988 ☐ 1989 ☐ 1990 ☐ 1991 ☐ 1992 ☐ 1993 ☐ 1994 ☐ 1995 ☐ 1996 ☐ 1997 ☐ 1998 ☐ 1999 ☐ 2000 ☐ After 2000 ☐ Not

16. Widespread use of pocket terminals with radio links to computer services.
1977 ☐ 1978 ☐ 1979 ☐ 1980 ☐ 1981 ☐ 1982 ☐ 1983 ☐ 1984 ☐ 1985 ☐ 1986 ☐ 1987 ☐ 1988 ☐ 1989 ☐ 1990 ☐ 1991 ☐ 1992 ☐ 1993 ☐ 1994 ☐ 1995 ☐ 1996 ☐ 1997 ☐ 1998 ☐ 1999 ☐ 2000 ☐ After 2000 ☐ Not

17. Computer program beats world chess champion for first time.
1977 ☐ 1978 ☐ 1979 ☐ 1980 ☐ 1981 ☐ 1982 ☐ 1983 ☐ 1984 ☐ 1985 ☐ 1986 ☐ 1987 ☐ 1988 ☐ 1989 ☐ 1990 ☐ 1991 ☐ 1992 ☐ 1993 ☐ 1994 ☐ 1995 ☐ 1996 ☐ 1997 ☐ 1998 ☐ 1999 ☐ 2000 ☐ After 2000 ☐ Not

18. Birth of strong anti-computer "Luddite" movement.
1977 ☐ 1978 ☐ 1979 ☐ 1980 ☐ 1981 ☐ 1982 ☐ 1983 ☐ 1984 ☐ 1985 ☐ 1986 ☐ 1987 ☐ 1988 ☐ 1989 ☐ 1990 ☐ 1991 ☐ 1992 ☐ 1993 ☐ 1994 ☐ 1995 ☐ 1996 ☐ 1997 ☐ 1998 ☐ 1999 ☐ 2000 ☐ After 2000 ☐ Not

19. Widespread use of computers in public interviewing, eg in hospitals and social security offices.
1977 ☐ 1978 ☐ 1979 ☐ 1980 ☐ 1981 ☐ 1982 ☐ 1983 ☐ 1984 ☐ 1985 ☐ 1986 ☐ 1987 ☐ 1988 ☐ 1989 ☐ 1990 ☐ 1991 ☐ 1992 ☐ 1993 ☐ 1994 ☐ 1995 ☐ 1996 ☐ 1997 ☐ 1998 ☐ 1999 ☐ 2000 ☐ After 2000 ☐ Not

20. Widespread use of pocket "calculators" with alphanumeric displays for drill-and-practice teaching of maths, languages, etc.
1977 ☐ 1978 ☐ 1979 ☐ 1980 ☐ 1981 ☐ 1982 ☐ 1983 ☐ 1984 ☐ 1985 ☐ 1986 ☐ 1987 ☐ 1988 ☐ 1989 ☐ 1990 ☐ 1991 ☐ 1992 ☐ 1993 ☐ 1994 ☐ 1995 ☐ 1996 ☐ 1997 ☐ 1998 ☐ 1999 ☐ 2000 ☐ After 2000 ☐ Not

21. Comprehensive information on all citizens stored in a central national computer database.
1977 ☐ 1978 ☐ 1979 ☐ 1980 ☐ 1981 ☐ 1982 ☐ 1983 ☐ 1984 ☐ 1985 ☐ 1986 ☐ 1987 ☐ 1988 ☐ 1989 ☐ 1990 ☐ 1991 ☐ 1992 ☐ 1993 ☐ 1994 ☐ 1995 ☐ 1996 ☐ 1997 ☐ 1998 ☐ 1999 ☐ 2000 ☐ After 2000 ☐ Not

If you wish, please insert here your name ..... and address .....

90/25

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MICROPROCESSOR NEWS

Control for car exhausts

ANOTHER runner in the race to provide control systems for car exhausts is Bosch, which now has available a Lambda Probe, a device that provides the essential feedback to fuel injection systems on the state of the exhaust gases as they leave the engine.

The probe itself is mounted in the exhaust pipe of the car and measures the stoichiometric air/fuel ratio, which gives an accurate indication of the completeness of combustion in the engine.

The output from the probe is then passed to a Bosch-developed microprocessor to interface the result into the fuel injection system to correct the fuel/air mixture.

The equipment can only be used with lead-free petrol, which currently restricts its market, but some are already in use on Volvo cars sold in California.

The probe meets the requirements of the US emission control legislation, which is due to become law in 1980.

F100-L interface sets now available

THE interface set for the Ferranti F100-L 16-bit microprocessor is at last available from the company in quantity, and it will be followed by two memory interface devices early next year. The company is also quietly moving into the OEM system market with a wide range of board-based products.

Replacing a considerable amount of random logic, previously the only other way to interface the processor, the set consists of a general purpose clock generator, which can be used for other applications besides the F100-L, and a control chip and a data chip, designated F111-L and F112-L respectively.

The chips can be operated in any one of five modes. These are a buffer mode for termination of the I/O bus, a memory mode for interfacing memory or memory mapped I/O, a peripheral mode for handling fast, autonomous peripherals and program and data interrupts, a special processing mode where additional processing power beyond the capabilities of the F100-L is required, and a bus extension mode which provides the equivalent of fully ported operation in a big minicomputer.

In many applications, however, Ferranti has already found that these devices are either under utilised or consume excessive power for the task required. Specifically, this has been in the area of memory interfacing, so it will be introducing the F113-L and F114-L memory interface chips early next year. These will be manufactured out of CDI-processed Uncommitted Logic Arrays, and will sit on the system I/O bus. In operation, they will recognise a valid memory address, and access the memory as the data arrives, or is required.

The two versions will offer high speed operations with a 650 milliwatt dissipation (F113-L), or a low power operation of 65 milliwatts (F114-L). This compares with a 1.7 watt dissipation in a similar role by the standard interface set.

Without any announcement, the company has also entered the OEM systems market, and now has a wide range of board assemblies available for use with a 13-slot, 19-inch card frame. Two CPU boards have been produced, one equipped with CPU and timer, and the other with CPU, timer and 4K of RAM. Three read/write memory boards are available, offering 8K, 10K and 32K, constructed from Mostek RAMs, and these are complemented by a PROM board holding up to 8K in 1K increments.

Four different interface boards are provided, these being for V24, paper tape unit, floppy disc drive and cassette recorder, and there is also provision for the use of a control handset with the system, which has its own dedicated interface card.

For special processing applications, there is a three card set that extends the arithmetic capabilities of the CPU chip, and as a further extension to the system a card is available using the interface chip set in its bus extension mode. Lastly, for those applications requiring special facilities, a pre-drilled bare card is available.

Intel autumn courses

DETAILS of the next batch of courses to be run at its UK headquarters have been announced by Intel. As with previous courses, these will be a mixture of lectures and hands-on experience costing £110 for the three-day and £85 for the two-day events.

Titles and dates for the courses are: An Introduction to microcomputers, October 3-5, November 28-30; Using the 8080 and 8085, October 10-12, November 14-16; Using the single chip 8048/8748, October 17-19, November 21-23; Programming in the resident high level language PL/M, October 31-November 2; Getting the best from single board computers, November 3-4; How to use a microcomputer development system — the hardware and software, November 17-18, December 1-2; Using the new advanced peripheral ICs to best advantage, November 24-25.

Further information can be had from Miss L. Scott, course administrator, phone 0865 771431.

Sicob launch of HP desk top system

THE first in its new generation of desk top computer systems, called the Series 9800 System 45, has been introduced by Hewlett-Packard.

Unveiled this week at Sicob in Paris, System 45 features the integration of all the required main peripherals into the hardware. These include the keyboard, incorporating a full QWERTY character set, numeric keypad, plus edit and user-definable function keys, a 12 inch CRT display of 80-characters width by 24 lines depth, a single magnetic tape cartridge drive offering 217K bytes of storage, with a second cartridge drive available as an option, and an optional thermal printer capable of producing 80-character lines at 480 lines per minute.

On the software side, the computer uses a new, enhanced Basic interpretive language that conforms to the ANSI standard, a unified command structure, overlapped processing and an optional graphics package that can be used with the CRT, the integral printer or an external plotter. To meet the requirements of the scientific and engineering market, Hewlett-Packard has also introduced a range of applications software packages.

The hardware is based on the use of two 16-bit microprocessors, which provide the overlapped processing facility. In operation, one is dedicated to computational functions, while the other handles all input/output, formatting and systems management.

This approach greatly increases the throughput of the system, compared with serial processing, while optimising its I/O operations. To further reduce the workload on the CPU, the system also employs separate microprocessors for the CRT, tape cartridge and printer. The operating system for the computer is held in 98K bytes of ROM, and provides a unified command structure for all I/O operations.

A minimum configuration System 45 offers 16K bytes of read/write memory, which is expandable up to 64K bytes. In addition, the system can address a variety of mass storage media, including the 210K byte built-in cartridge system, 460K byte floppy discs, and hard discs with capacities of between 15 and 50 megabytes.

The graphics software provides such functions as inverse video, blinking, and underlining, with plotting functions such as axes and tick marks and axes and grids for graph work, window plotting, and bidirectional plotting. Editing functions include selective erase.

The software incorporates the facility to dump directly on to the printer without erasing the CRT plots, and the same facility is available for an external plotter.

A range of applications software is already available for the System 45, aimed specifically at its prime market area of the scientific and engineering disciplines.

The minimum configuration System 45, consisting of 16K byte read/write memory, CRT, one cartridge drive, operating system, keyboard and I/O ports for 16-bit parallel, IEE 488-1975, BCD, and V24, is available for £8384. An upgrade to the maximum configuration, which adds a total of 65K bytes read/write memory, the optional cartridge drive, graphics software, and the optional thermal printer, will bring the total price to £16,372.

For buyers requiring the maximum configuration from the outset, however, the company has available a system package, which includes all the elements of the maximum configuration, for a total price of £14,491.

Approval for design courses

TRAINING courses run by Bleasdale Computer Systems on the design and construction of microprocessor-based systems have been approved by Motorola Semiconductors. Part of that approval has been based on the range of hardware designed by Bleasdale for system configuration work, and the firmware "stripped down" operating system produced for software development.

The hardware is based on four separate items, a 16 station non-encoded keyboard, a 6 digit hexadecimal LED display, an 8 digit thumbwheel switch unit, and a 20-column alphanumeric impact printer.

They have been designed so that they plug directly into the I/O board of a Motorola 6800-based system, and interest has been high enough for Bleasdale to offer the units on the open market.

The operating system is currently being designed for implementation as a ROM device for integration in the memory of a 6800-based system.

It operates on the basis of providing software handlers to control the functions of the four hardware units, so that I/O functions to these units can be carried out by calling up the software handler as a subroutine. As an extension of this, Bleasdale is also working on the development of a Fortran interface for microprocessor systems.

Further information on the courses run by Bleasdale, which continue through the winter, can be obtained from the company.

Bigger memories from National

MEMORY expansion for the National Semiconductor Series/80 microcomputer systems is now available in the shape of two plug-compatible memory boards, the BLC 016 and the BLC 406.

Both provide an additional 16K by 8 bits of RAM, implemented with 32 National MM 5271 devices. The BLC 406 also offers space for up to 8K by 8 bits of ultraviolet erasible PROM or mask programmed ROM, in 256 byte increments.

Typical read cycle time for the boards is 735 nanoseconds [illegible] write cycle time [illegible] conds and the [illegible] 735 nan[illegible]

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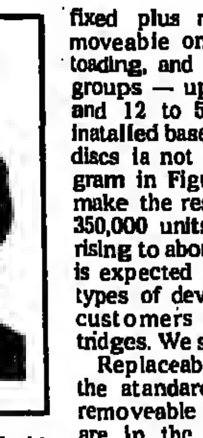
STORAGE MEDIA

Now for programs to suit job, not core size

By Sean O'Connell



Long gone are the days when data storage media in most installations meant punched cards, paper tape and maybe magnetic tape — but nothing more.

These media are still very much around; but the user today is faced with a wide range of alternatives, including a bewildering variety of magnetic disc mass storage media.

At the same time easy-to-understand ferrite core is being superseded as the leading main memory medium by a frightening assortment of semiconductor technologies — bipolar, Mos, sos, cmos, vmos etc.

And between mass storage and main memory at least two forms of intermediate storage are starting to edge their way in. These are magnetic bubble memory and charged coupled devices, CCDs — two completely different technologies aimed at similar applications.

Two of the articles in this supplement on the data storage media are devoted to describing bubble and CCD memory in detail, while the introductory article by Sean O'Connell provides a comprehensive guide to most of the media types available today.

FIVE or ten years ago life used to be simple for computer staff. The DP manager and systems analyst could take a quick squint at their organisation's needs, scribble a batch processing stream and the necessary storage requirements, have a chat with their friendly mainframe salesman and bingo, they would all be in business. Apart, that is, from the poor Joe Programmer and the user department who actually had to foot the bill.

But now the world has turned upside down. The old-fashioned combination of core, disc and mag tape has given way to a host of competing technologies. This may make life easier and better for the user and programmer, but causes severe headaches for the higher-paid DP staff, both on the supplier and consumer sides of the fence. New and improved technologies make concepts like paged and virtual machines possible, which in turn means that programs can be written to suit the application, not the core size.

Good old core memory is still there, but sinking fast. At a price of about 0.2p per bit it is rapidly losing ground to competing immediate access memory types. IAM falls into two categories: read-only memory (ROM), and random access memory (RAM) which should be more accurately described as read/write memory but isn't.

ROM is essential for microprocessor systems because of its non-volatility on power-down and extremely low cost both to buy and use. It is useless, of course, for normal programming work, because its contents have to be burnt in at manufacture, but it is ideal for smart controllers, communications protocol supervisors and other fixed-program systems.

Core is a couple of orders of magnitude more expensive than ROM, so loses out badly there. It also loses out to other forms of RAM. One major competitor is metal-oxide semiconductor (MOS), which has a very high packing density (4K to 16K bits on a single chip, and going up), and is dropping in price to about a tenth of the price of core. This high packing density is called large-scale integration (LSI), and an even more sophisticated product is coming — Very LSI, or VLSI.

Another rival is bipolar technology. This can be transistor-transistor logic (TTL), emitter-coupled logic (ECL) or silicon-on-sapphire (SOS). Bipolar RAM has the advantage of being incredibly fast — of the order of 20-odd nanoseconds as opposed to about 175 nanoseconds for MOS, but it costs about 0.8p per bit, whereas MOS costs about 0.1p per bit.

It looks as though bipolar memory will be used mainly in applications where very fast access times are essential, such as cache or scratchpad store, local buffers, registers and the like. MOS will be used for main memory, holding pages of program instructions and semi-permanent data areas.

It should be remembered that the prices given above are what the mini/mainframe manufacturers have to pay to the component suppliers — the end-consumer buys packaged boards (if he has any sense), which require printed circuit boards (PCBs), edge-connectors, back-plane wiring, power supplies, clocks and other bits and pieces which will possibly double the cost per bit.

The really exciting developments in the next four years in both RAM and fast auxiliary stores, such as discs, will be in the impact that new technology like magnetic bubble memory (MBM), charge-coupled devices (CCD) and electron beam techniques (variously called EBAM and BEAMOS), has on them.

Guessing ahead is dodgy, but the consensus of opinion among the suppliers seems to be that both RAM and disc markets will not be materially affected until the early 1980s. Nonetheless, it's worth having a quick look at these devices or techniques.

Bubble memories are rather like solid-state disc stores — data is recorded magnetically on a series of chips. The magnetic areas, or bubbles, are called (rather confusingly) "domains," possibly because these areas are not physically spherical, but more like tangled-up macaroni worms. Be that as it may, these bubbles whizz around in a circle, bi-directionally if need be, and are read and written by thin-film magnetic heads. Bubbles are pretty small — about 500 bubbles can be packed on to a pinhead, with a density of up to a million bits per square inch. Access time for MBM is about 1 to 4 milliseconds, with transfer rates in the region of 150K-bytes per second.

Charge-coupled devices are conceptually quite different, in that they are not magnetic devices. They are extensions of existing MOS techniques, with the chips arranged in a logically circular form, so that the data is shifted cyclically around the array in bit-serial fashion. Access times are much faster than MBM — 100 microseconds typically, but with a packing density of about a third of MBM. Transfer speeds are about twice as fast.

Electron beams are a combination of MOS and electronic scanning. A one-micron electron beam is directed to scan or write into the oxide side of a silicon surface, a bit like a TV screen. This store is non-volatile, unlike CCD but similar to MBM, with impressive performance. Packing density is around three million bits per square inch at present, but potentially 100 times that is possible. Access times are about 30 microseconds, with transfer times in the order of 1 to 2 Megabytes per second.

Prices are very difficult to predict at present, but some guesses have been made. CCD might be costing about 0.04p per byte, MBM about 0.013p and electron beam about 0.004p. All very astounding, but don't hold your breath waiting for the salesman. It is doubtful if these devices will arrive until the early 1980s.

Rotating drums and head-per-track disc drives seem to have gone to sleep — or even died — these past five years. Rigid and flexible (floppy) discs have a far better price/performance ratio, although there is no doubt that a niche exists somewhere for drums in the future. However, last year some $1,876 million was spent on moving-head rigid disc drives, with US manufacturers collecting over 90% of that revenue. Reliable estimates indicate that by 1980 this figure will grow to between $3,000 million and $4,000 million — and this excludes floppies! This is going to be shared among the present 34 manufacturers, only 11 of whom exist outside the US (assuming no mergers or bankruptcies).

Cartridge discs are by far the most popular in terms of units installed. They can be either fixed plus removeable or removeable only, front- or top-loading, and sub-divide into two groups — up to 12 Megabytes, and 12 to 50 Megabytes. The installed base for small cartridge discs is not shown on the diagram in Figure 1 because they make the rest look sick — like 350,000 units installed in 1976, rising to about 700,000 in 1980. It is expected that by 1980 other types of device will be wooing customers away from cartridges. We shall see.

Replaceable disc drives are the standard six- and 11-pack removeable devices. Capacities are in the order of 30 to 60 Megabytes for six-packs, and from 100 to as much as 300 Megabytes for the 11-packs. Winchester technology (heads in the pack rather than on the drive) is tending to hit this market rather badly, but medium costs give the older devices a good advantage — from just over £100 to just under £500 for the standard six- and 11-packs, as opposed to twice that top figure for Winchester-type packs. Canny users persist in the annoying habit of taking this factor into account when calculating storage costs.

Data module drives were the first Winchesters launched by IBM. Now they have been superseded technically, largely because of their inferior capacity (35 to 70 Megabytes) and their poor comparison with storage modules.

"Storage module" is a generic term to cover the gap between cartridges and the 100-Megabyte-plus replaceable drives. Capacities are typically

● Turn to page 22

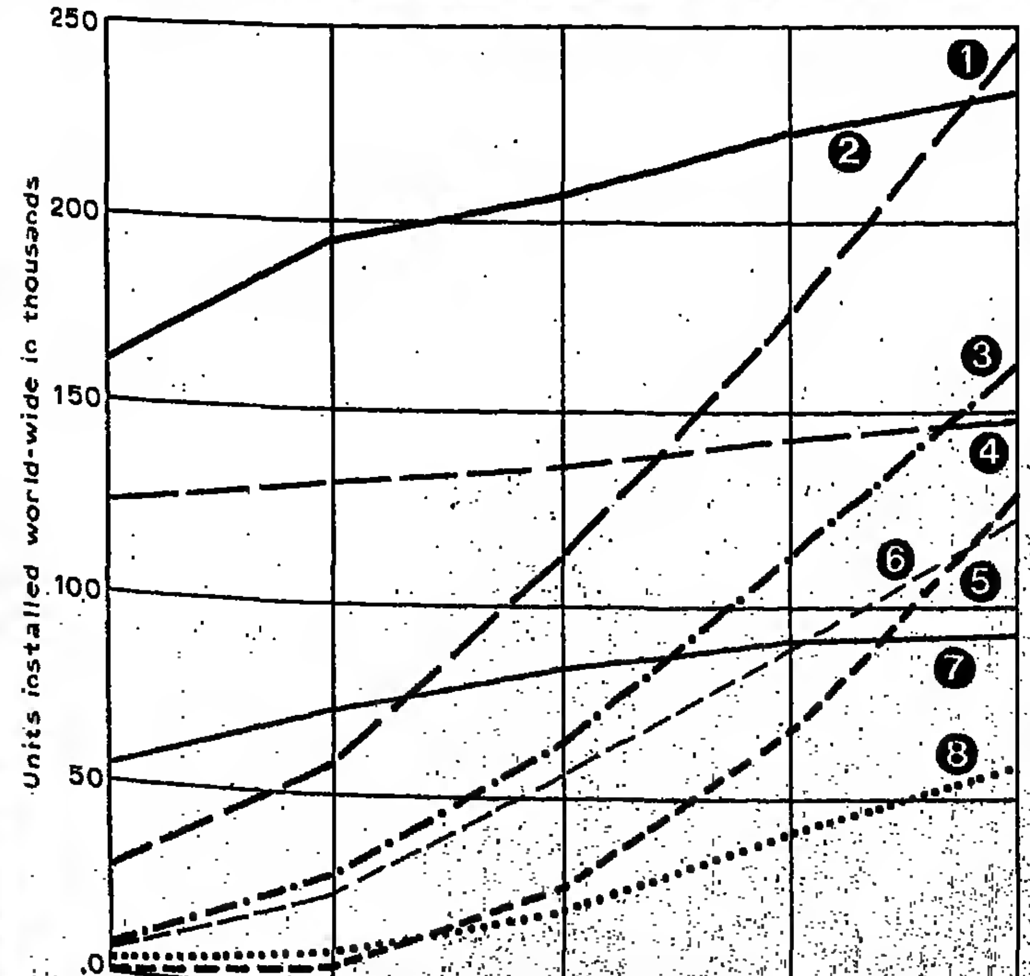


Figure 1: Storage media. Key to numbers — 1. Fixed discs, up to 12 Megabytes; 2. Replaceable discs, 100 plus Megabytes; 3. Storage modules, 25 to 50 Megabytes; 4. Replaceable discs, 30 to 60 Megabytes; 5. Fixed discs, 12 to 200 Megabytes; 6. Fixed Discs, 200 plus Megabytes; 7. Data modules, 35 to 70 Megabytes; and 8. Cartridge discs, 12 plus Megabytes.

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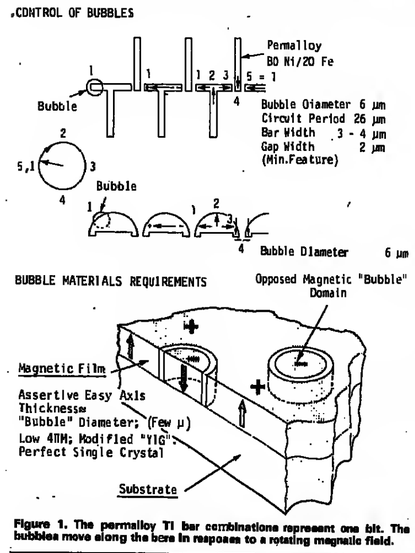

Figure 1. The permalloy TI bar combinations represent one bit. The bubbles move along the bars in response to a rotating magnetic field.

The dawning of a new era for backing store

By Jeff Steel

MAGNETIC bubble memory represents a new end very considerable development in the evolution of computer backing-storage devices. To those of us brought up with the traditional range of electro-mechanical storage devices such as magnetic tapes and discs, MBM represents a new trend towards data storage in solid state devices. To those who, like myself have suffered the slings and arrows of outrageous head-crashes the dawning of an era where there is nothing mechanical to crash into has to seem promising at the very least.

To be discussed later, magnetic tapes and discs appear to be safe yet for quite a while in the area of large scale storage. MBM technology, however, is advancing at a considerable rate on a worldwide scale and it would be a brave man indeed who could make any confident prediction beyond the next three years.

The properties of magnetic bubbles were first observed in 1960 but development did not begin in earnest until 1967. This was in connection with the US Space programme and only in the early 1970s did it emerge as a new potential data storage medium for the computer industry.

The basic bubble memory material is Yttrium Iron Garnet, YIG. This is grown as a thin film, six microns thick, on a magnetically inert substrate. The YIG is doped with Samarium and Gallium to give it precisely the correct magnetic properties. The YIG thus grown has weak magnetic fields across it forming random serpentine patterns. When an external magnetic field is applied at an optimal strength the effect is that these magnetic zones fragment into cylindrically shaped "domains" of magnetism. These are the magnetic bubbles.

Each bubble is separated by

● Turn to page 23

Programs to suit jobs

● From page 21

In the 25 to 80 Megabyte range, with the technology and *de facto* standards being set by Control Data Corp (for a change). The growth rate for storage module installations is going up much more rapidly than for data modules, and IBM is discontinuing sales of data modules in favour of 3344 and 3350 Winchester-type devices.

Fixed-disc drives are the extension of the early Winchester technology, and are the big growth area for rigid disc sales. The basic idea is that the packs are rarely, if ever, taken off the drives — these machines hold the virtual memory and database of the host central processor they live with. Fixed disc drives come in three broad models: less than 12 Magabytes, 12 to 200 Megabytes, and the 200+ Megabyte big 3344 and 3350 systems.

Floppy discs are the real growth area of all rotating memory devices. Used principally for data entry, backing store for small business computers, incremental dumping and other similar application, floppies have a tremendous future. Last year about 150,000 were shipped, and by 1980 the figure will be about half a million per annum. At present floppies have a quarter-Megabyte capacity, but this can easily be doubled by turning the things over ("flippies," no less). By doubling the density, which is no great technical feat, we can have a one-Megabyte rotating medium which can be sent through the post for ninepence. The media cost about £3.50 each, and the drives themselves cost between £750 and £1,250 each, making them almost irresistible to the market they are aimed at. The standard floppy in its envelope is 8 inches square, but now we have a 5¼ inch square "mini-floppy," holding 90 kilobytes, aimed at the data-logger and do-it-yourself hobbyists' market.

There is a very important difference between flexible and rigid disc technology. Rigid disc heads "fly" a few fractions of an inch above the surface of the disc, and so last indefinitely if kept clean. Floppies, however, require physical contact with the read/write heads. Consequently, floppies wear out, and the best life-time figure is 600 hours of "in-contact" time. Because people tend to mistreat floppies, it is a good idea to assume an effective life of half this time, but it is also important to remember that the "in-contact" time is only about a fifth to a third of the total time it is on the drive. As a rough rule of thumb, it is advisable to junk floppies after 1,200 to 1,500 hours of use — or life — or once every six or so months of prime shift use.

Mag tapes are very well known, and there is not much to say about them apart from noting the current fashion by manufacturers promoting 625 bits per inch packing density drives, sway down the path of non-standard devices for media. Why this should be a good idea is a little unclear except to sell more tape drive units. Standard 2,400 feet by half-inch wide industry-compatible reels cost about £7 each now, and will not change much. One interesting point about mag tape is that the mean average usage of any reel is 10%, or the first 250 feet of a 2,400 foot reel.

An alternative to floppies for collection and storage of low-volume data is available in the cassette and cartridge type. Philips have set the de facto standard for cassettes, which is enshrined in two versions of the ECMA standard (Number 3, Merks 1 and 2). At present the cassette tape accounts for about 50% of the mini backing store market by value, but this will decline to about 30% in 1980.

However, shipments are going up from about 220,000 units per annum now to about 300,000 in 1980. The big selling point of the cassettes is the drive unit price — from as low as £45 to about £300, even though these are servo motors in each drive. Media costs are about the same as for floppies, £3.50 or so, which makes them very attractive to users who want to record data serially rather than randomly.

One disadvantage with cassettes is tape life — they have a nasty tendency to stretch and snap at the most inconvenient times. This has led to the development of cartridge tape, which have a Heath-Robinson look about them, but is in fact very effective. Instead of the motors there is only one in the drive unit — the rotation is by differential driving by a rubber band, assisted by a rubber band. Inside the cartridge, which is of the cassette type, giving much higher mean time between failure figures. Unfortunately cassettes are quite high, at about £1 each, and the drives themselves are between £200 and £600 each. Last year some 16,000 units were shipped, and this is expected to grow by 1980 to about 52,500 units per annum.

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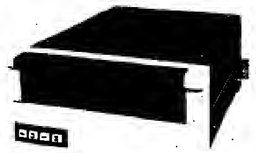

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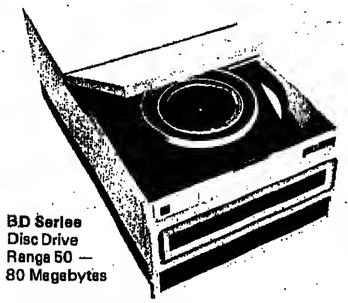

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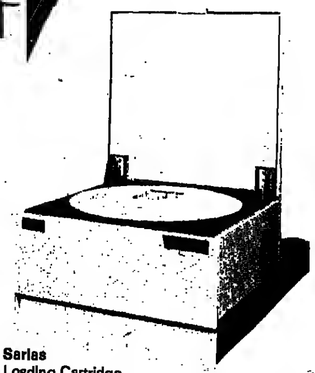

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How magnetic bubble memory devices work

A MAJOR advance in computer backing-store must be the magnetic bubble memory and it would be a brave man who could confidently predict the state of the art after 1980.

Jeff Steel describes how a bubble memory works and he suggests areas of the market to which it would seem to be suited.

He sees two short-term impacts for M6M. One, it will dramatically increase efficiency; secondly, it will, in mass production, be extremely cheap. And it has no apparent disadvantages.

● From page 22

an interval from the next. They are stable over a wide operational temperature range from 0°C to +70°C. As long as the magnetic field remains constant the bubble will remain where it is. If the magnetic field is rotated the bubble will move. As the strength of the magnetic field is increased the effect is for the bubble to shrink until it collapses and the YIG is completely magnetised in the same direction as the applied field. Similarly, if the magnetic field is decreased "stripout" occurs ie, the bubbles elongate to the extent that each one fuses with the next until a strip of magnetism is formed.

There is, therefore, a "happy medium" level of magnetisation at which the bubbles are stable, controllable and useful for data storage.

In considering the various characteristics of the bubble memory device let us at the outset be clear as to the basic objective of the device. It is to store data in binary format where a bubble present is designated "1" and a bubble not present is designated "0".

Having stated the objectives of the device the functions follow logically. The device will have to create bubbles ie, write binary data. It will have to detect bubbles ie, read binary data. It will have to store and move bubbles. It will have to erase bubbles. Finally, it will have to provide a stable environment in which the bubbles, once created, can exist.

Bubbles are created by a write-element. Technology provides two different methods. One alternative is that a seed bubble may be held in the write element. As the seed is sliced in two, one half is retained in the write element and the other half is fed into the storage loop, qv. Each half rapidly grows to full size and the seed may be reused. The other method is that a totally fresh bubble can be nucleated from an electrically pulsed conductor within the write element. As in the previous case, it is then fed into the storage loop.

Having created a bubble the next problem is accurate storage and movement. This is accomplished by means of a circuit of permalloy TI-bars which are deposited on to the YIG. Each minute TI-bar represents one bit, the presence or absence of a bubble in a TI-bar being designated "1" or "0". The circuit of TI-bars is configured into looped rows, and various patterns of these are discussed later. Movements of data through each loop is effected by applying a rotating magnetic field by means of two magnetic coils held within the device. The effect of this rotating field is shown in Figure 1.

In a reading operation a copy of the data to be read is taken by a replicate element and passed to the read element. In the read element the bubbls may be detected as follows. The bubble is expanded at right angles to the track in which it is travelling. The elongated bubble is passed through a permalloy sensor and this causes a change in the electrical resistance. This is monitored and a signal passed to the CPU.

The erasure of bubbles may also be achieved in one of two ways. Either an erase element may be present which destroys the bubble with an increased magnetic field or, alternatively, an erase track may be present. Unwanted bubbles enter this track where they are, in effect, run off the data storage surface.

The overall stable magnetic environment is provided quite simply by the inclusion of a small permanent magnet of suitable strength. This will maintain an environment favourable to the existence of bubbles once created without their stripping out or collapsing.

From all this it will be seen that there is quite a lot happening within the device. An indication of size should therefore be given at this point: the total package is about 2cm x 1cm x 1cm. A number of these packages may be plugged into a circuit board. The area of the YIG element itself is about 5mm square.

Having described briefly the principles on which the device will operate, two questions are immediately begged: how much data can be packed into a chip and what are the methods of data organisation ie, what is the arrangement of the loops of which I wrote earlier.

Firstly, data-packing is a function of two variables: the physical size of the TI-bar and the density of the lattice ie, the distance from one TI-bar to the next. In turn, each of these depends on the technology which deposits the TI-bars on the YIG. Recent developments have led from a capability to print 16K bits on to a chip, giving a six micron bubble diameter, to a capability of printing 64K bits, giving a one micron bubble diameter. As progress is made into electron-beam lithography no doubt the one micron bubble will be surpassed. A 0.3 micron bubble has been reported but I am unable to comment on how commercially viable this is.

As the packing density increases so must the sophistication of data organisation. The earliest circuits of TI-bars were as a simple loop. This was of a purely serial design and average access times, for the first bit were 70ms for a 16K bit chip and 640ms for a 64K bit chip. Thus as electron-beam lithography was beginning to promise ever greater packing densities the unfortunate implication for the systems analyst was exponentially increasing access times.

In order to combat this, a number of alternative architectures were experimented with, the most successful to date being the major-minor loop. A typical arrangement for a 64K bit chip was 128 minor loops each of 513 bits. With this type of organisation the average access time for the 16K bit chip dropped to 2ms and, significantly, 2ms was also now the access time for the 64K bit chip. (Both figures for the first bit).

Table 1, which doubtless has numerous exceptions, attempts to marshal together some of the main points to project where in the market place bubble memory will stand when it becomes generally available.

We may safely say that due to capacity limitations bubble memory is unlikely to compete as yet with moving-arm disc or 1600bpi tape. It may well, however, compete with floppy discs or tape cassettes in the micro and mini computer area. Current indications are that cost per bit will initially be slightly higher for bubble memory but as it is at the very beginning of its life cycle, no doubt mass production will bring this down rapidly.

Money and effort being spent in research and development around the world are astronomical — especially for such a new technology. One hears reports of developments towards a 1 Megabit chip. A board with 18 of these would be a serious challenge to the head-per track disc, especially if the above access times and costs are improved upon as seems likely.

It is also projected that bubble memory will have a very successful usage for temporary storage in such areas as printer/keyboard terminals, VDUs, point-of-sale terminals and even as a medium for storing frequently used numbers in a telephone hand-set.

As compared with the current range of data-storage media the advantages of bubble memory may be summed up as follows. It is non-mechanical and non-volatile. It consumes little power and is very compact. It is extremely reliable and in mass production probably extremely cheap.

The highly competitive world of memory technology has seen data storage devices before. However, perhaps no device previously has ever offered such a wide range of advantages with no apparent disadvantages. Certainly, no device can ever have been researched by so many firms before it ever reached the market — IBM, Rockwell, Plessey, Fujitsu, Hitachi, Bell, Texas Instruments, Hewlett-Packard, Nippon, Philips, etc.

I have described very briefly how a bubble memory device operates and have attempted to assign it to areas of the market to which, initially, it would seem to be most suited. What it will ultimately lead to, who can say? The next few years should prove most interesting.

	First bit access time (m/s)	Cost (cent per bit)	Total-online (Kbytes)
Bubble memory (Assumes a board of 16 x 64K bit chips)	1	0.06	126
Floppy disc	460	0.05	250
Head-per-track disc	5	0.05	2,000
Moving-arm disc (Assumes 8 x 80 Mbyte discs)	50	0.0025	640,000
Fixed mini-disc	100	0.004	25,000
Tape cassette (800 bpi)	-	0.04	300

Table 1. Some of the main features of bubble memories are tabulated here to show where the device will stand in the marketplace when it becomes generally available.

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Bryn Edwards, Computer Room Manager, BSO

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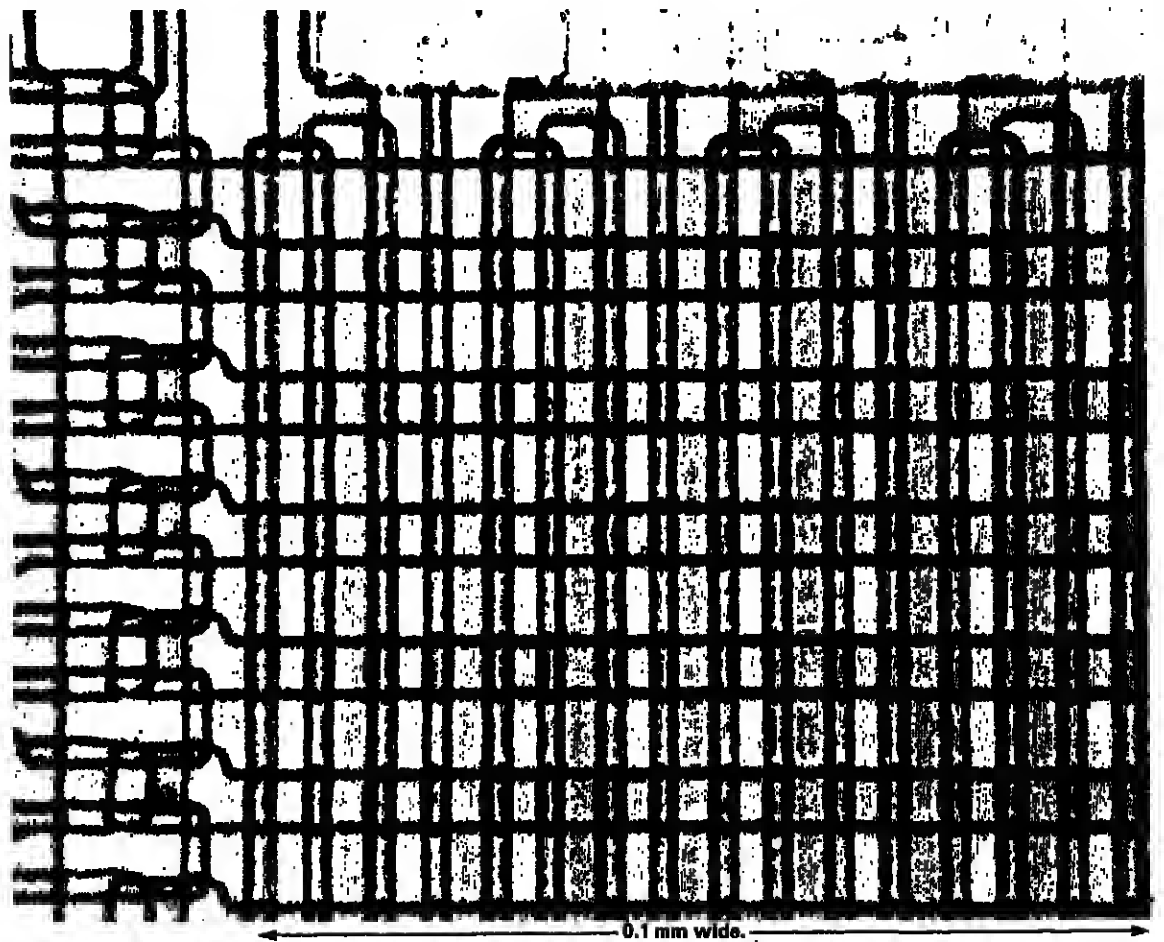

Above is a photomicrograph of a charge coupled device showing a density of 4K bits per millimetre square.

CCD, the memory for all digital systems

Ken Baker

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The parallel development of CCDs and magnetic bubble memory systems over the last few years has helped to fill a considerable gap in the hierarchy of mechanically and electrically addressed storage technologies. The cost per bit at the system level for the different technologies is seen in Table 1 to be a function of the system access time. Although there is no gap in cost there is a significant difference between the access time of the slowest RAM or core memories and the fastest disc memories.

In computer memory applications, it can be seen from the table that initially, CCD is in a strong position to attack the fixed-head disc market, since it can offer access times of between one and two orders of magnitude less for similar costs. This occurs because CCD can maintain a 2-4 times cost advantage over MOS random access memories. There are good reasons why this cost differential exists between the two technologies. In the longer term, computer memory hierarchies may well be restructured so that they can take fuller advantage of the better speed/cost ratio of CCD.

Another major advantage of CCD memory (in common with RAM) which is not apparent from the table is that, being a semiconductor memory, its speed/cost advantage is preserved down to much smaller memory sizes for microcomputer applications. Hence, CCD will also be an important technology for applications where only modest amounts (10-100 K-bits) of serial storage are required.

The technology for making CCDs has evolved in response to the systems requirements of the IC designers' circuit innovations, not only in charge coupling but also in RAM cell design. The CCD has evolved from the early surface channel metal gate concept first investigated at Bell Labs, through buried N-channel and coplanar processes using single, and later double-layer, polysilicon gate.

Both buried and surface channel technologies are currently being pursued for CCD. It is unlikely, however, that a buried channel version of the process will be used for memory applications. The advantages of the N-channel double polysilicon gate process are inherently better device stability and speed; autoregistration can be achieved, leading to greater packing density and higher performance in peripheral on-chip circuitry; greater flexibility in memory organisation can be realised, because of a two-phase clocking capability and the availability of extra levels of interconnection.

Current CCD memory products employ a technology which is essentially the same as that used in making 4K and 16K NMOS static RAMs. This provides the further advantage of compatibility with industry standard memory and logic products and processes.

In operation a charge coupled device can be regarded as a simple extension of an MOS transistor. The application of the block voltage to any of the transfer electrodes causes the underlying silicon layer to become depleted.

The depleted layer acts as a reservoir or "well" for any minority carrier charge injected into it, and the application of clock voltages to successive electrodes causes the charge to be transferred laterally along the surface of the silicon.

This operation is essentially that of a shift register, and although it can be used to shift analogue quantities of charge, the presence or absence of a charge packet represent[illegible] cal 1 or 0, respectively in [illegible] memory applications.

In the simple stru[illegible] described three [illegible] phases are required to [illegible] directionality of charge tr[illegible] but many different CCD [illegible] nologies now exist, [illegible] which incorporate asym[illegible] electrode structures [illegible] ing only two clock phas[illegible] thereby simplifying the [illegible] driving requirements. Char[illegible] injected and extracted fr[illegible] CCD by means of input [illegible] output diffusions, analog[illegible] the source and drain of a [illegible] transistor. The presence o[illegible] sence of charge is detected [illegible] appropriate logic [illegible] generated by on-chip [illegible] amplifiers using conv[illegible] MOS circuitry.

Charge injection into the [illegible] potential well is dependent [illegible] logic 1 or 0 being written [illegible] charge packet, under ideal [illegible] ditions, should traverse [illegible] via the potential well un[illegible] ed. In practice, this is [illegible] case. The minority carrie[illegible] vel extremely close to [illegible] conductor oxide interface [illegible] has a relatively high de[illegible] traps. Some of the carr[illegible] readily caught up in these [illegible] and this results in attenu[illegible] the charge packet.

If the attenuation is [illegible] enough, the sense amp[illegible] the end of the shift regi[illegible] not translate the corr[illegible] level. The attenuatio[illegible] charge packet on each [illegible] is known as transfer ine[illegible] and should be of the ord[illegible] for acceptable CCD [illegible] devices. To ensure this [illegible] the case manufacturers [illegible] an ion implanted buri[illegible] channel beneath the [illegible] semiconductor interfa[illegible] charge is transferred [illegible] channel rather than [illegible] interface and transfer in[illegible] ciencies as low as 10⁻⁵ have [illegible] recorded.

Although CCDs are ess[illegible] ly analogue in opera[illegible] digital applications it is ne[illegible] sary only to distinguish betw[illegible] the presence or absence of [illegible] charge packet. Since this can [illegible] achieved with extremely sm[illegible] amounts of charge, typi[illegible] 0.05 picocoulombs, on [illegible] narrow CCD channels [illegible] necessary. This results in ex[illegible] mely high data storage den[illegible] so that one of the main [illegible] tions of CCDs is that of [illegible] digital memories.

Using an almost [illegible] process, CCD memorie[illegible] achieve three- to four[illegible] improvement in the bit [illegible] of RAMs with a corresp[illegible] reduction in the cost per [illegible] is partly because of the [illegible]ize and partly because of [illegible] simpler on-chip peripheral [illegible]try required with CCD [illegible]ory chips. Since data rates [illegible] normally not more than 10 [illegible] second, a surface channel [illegible] is usually preferred in [illegible] application because of its [illegible]r charge handling capability.

[illegible] CCD memory component [illegible] organised in a number of [illegible] configurations; the choice [illegible] depends on desired system performance.

There are important tradeoffs involving clock frequency, [illegible] number of phases, access times, [illegible] overhead for peripheral [illegible] and temperature range.

[illegible] any of the organisations the [illegible] is decoded from a number [illegible] individual memory blocks, [illegible] with its own amplifier for [illegible] charge sensing and regeneration. The mean access time to [illegible] acquire any bit of data is proportional to the number of bits [illegible] the memory block.

[illegible] synchronous or serpentine organisation, storage cells are [illegible] out along a winding path with a signal refreshing stage at each corner. Each bit passes through every storage element [illegible] one trip through the device. Therefore, the internal shift frequency is equal to the I/O data rate.

For block lengths between 128 and 512 bits, this simple recirculating loop organisation is [illegible] normally used, giving mean access times between 10 and 100 microseconds, depending on the clock rate.

In serial parallel serial (SPS) organisation, two single-channel serial shift registers of N bits [illegible] one large multichannel [illegible] register consisting of M [illegible] registers operating in step. [illegible] series of bits is fed into the [illegible] shift register at a high rate, [illegible] transferred in parallel into [illegible] multichannel register and [illegible] out through the other serial [illegible]ter. This arrangement accommodates more storage elements between refresh stages [illegible] has both high data rate and [illegible] power dissipation because [illegible] data bits are transferred at [illegible] lower clock frequency of [illegible] multichannel shift register.

[illegible]ough additional slow [illegible] are required for the [illegible] registers, this type of [illegible] organisation offers the highest [illegible] density that can be achieved [illegible] CCD memories. The most [illegible] widely used SPS block [illegible] is 4K-bits, giving mean [illegible] times of about 0.5 [illegible] seconds with a data rate of [illegible].

[illegible] this type of organisation [illegible] will make an impact on bulk [illegible] memories, e.g. disc replacement. Currently Fairchild and Texas Instruments are producing 64K CCD with this organisation. Intel, Plessey, Toshiba and Bell Northern are working towards 64K or 256K CCD.

Although there are many applications for serial digital memories, two large areas are display storage and online disc replacement. In the former, the faster recirculating loop organisation is sometimes more suitable, when immediate access to any line of displayed data may be necessary.

The line addressable RAM (LARAM) organisation integrates CCD and MOS memory concepts to provide shorter access times and reduced capacitive drive requirements. It consists of an MOS address selection matrix and a number of CCD serial shift registers or lines. As the name implies, any line is randomly accessible but its contents are accessible in serial form.

Implementation of CCD components into practical memory systems is analogous to that of fixed head disc (FHD). The constant rotation of the disc is analogous to the constant shifting of bits in the shift registers.

An example of the sort of memory card that is available is the Plessey PSM5463 containing 64K-bytes on a double Eurocard (9" x 6") and operating at 4MHz, providing data rates of 64Mbits/s.

The basic recirculating block within, say, a 64K CCD component is 4K bits. Hence, it is necessary to assign the address space A0-A11 to correspond to individual bits within a 4K block. Since the system operates in a cyclic mode it poses no external refresh requirement. Standby power can be less than 1μW/bit. A 12-bit status counter monitors all types of data shifts — read, write and recirculate (standby mode). In order to make a read or a write access to the CCD memory system, block mode direct memory access (DMA) techniques have to be implemented.

Applications for CCD exist across the whole spectrum of digital systems. Principal areas currently being pursued by Plessey Memories are in TV scanning, where the inherent high data rate and relatively low power per bit of a CCD memory system is well suited to TV scanning/imaging applications.

This of course covers the general field of VDUs and terminals whereby medical electronics, geological surveys, astronomical surveys and a host of other diagnostic aids are making large demands for CCD memory to provide a means of CRT refresh. The storage requirement of an average system is of the order of 8 M bits.

The second major application category is the disc replacement market. The availability of 64K devices, the commitment of major US and Japanese companies to producing digital CCDs and the announcements of the incorporation of CCD bulk stores by several computer manufacturers, augur the rapid incorporation of CCDs for serial data processing.

The CCD memory system will immediately make an impact in providing a fast front-ended cache for disc-based systems. In applications where multiport facilities exist, the queueing and the eventual response times become objectionable.

In order to make CCD competitive with total disc replacement, considerable innovation in design and system implementation is desirable. The use of redundancy techniques at the chip level is one such approach.

Table 1. [illegible] comparison for different memory technologies in 1977

Technology	System cost/bit (cents)		System access time		Units
	min	max	min	max	
Bipolar RAM	2	70	5	150	ns
MOS RAM	0.35	3.0	70	800	ns
Core	0.5	2.0	0.1	2	μs
CCD	0.01	0.35	0.03	0.15	ms
Magnetic bubbles	0.01	0.5	0.2	10	ms
Fixed head disc	0.02	0.10	1	100	ms
Moving head disc	0.002	0.02	10	500	ms
Mass storage and [illegible]	<0.001	0.05	0.5	100	s

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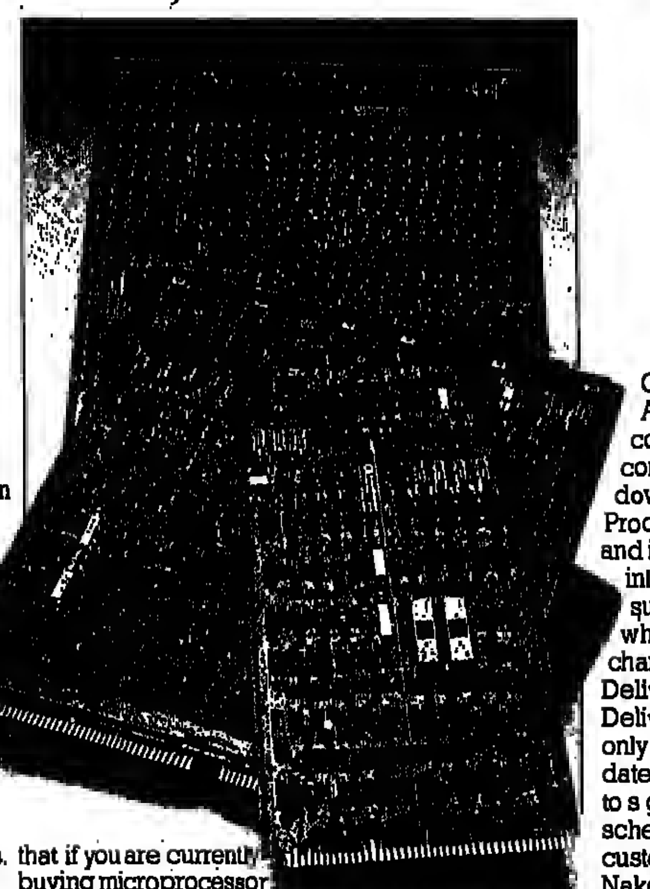

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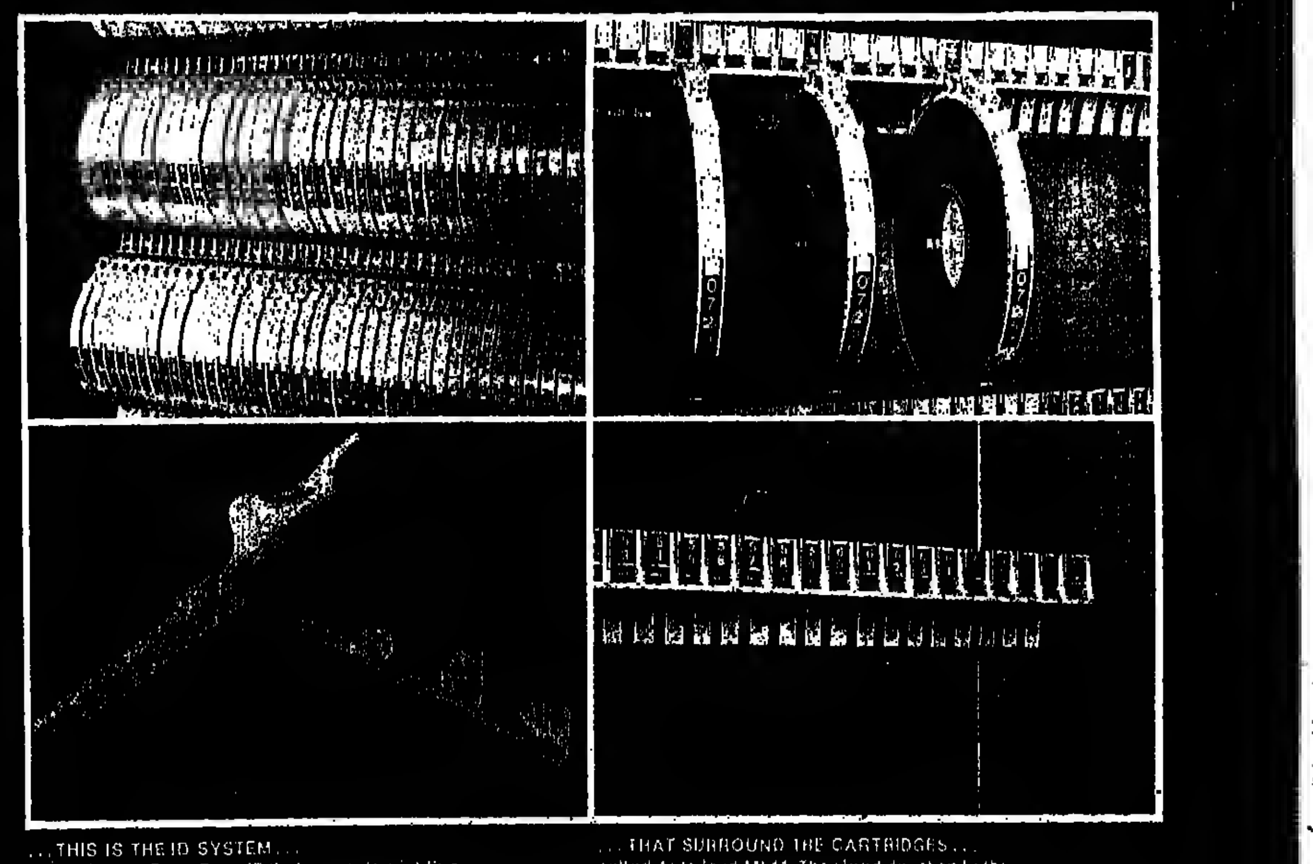

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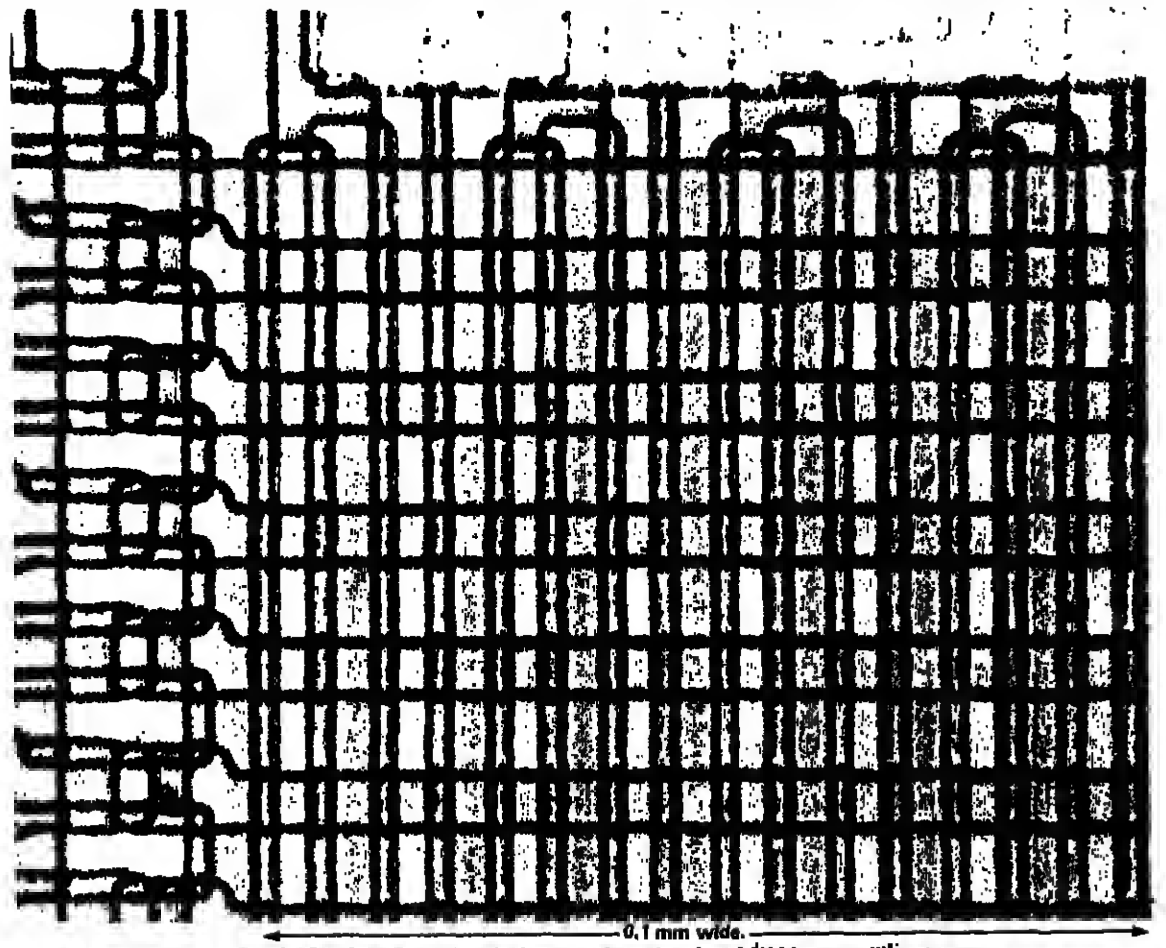
CCD, the memory for all digital systems



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Charge injection into ... potential well is dependent ... logic 1 or 0 being written ... charge packet, under ... ditions, should travel ... via the potential well ... ed. In practice, this ... case. The minority carrier ... val extremely close to ... conductor oxide interface ... has a relatively high ... traps. Some of the ... readily caught up in ... and this results in ... the charge packet.

If the attenuation ... enough, the sense amp ... the end of the shift register ... not translate the ... level. The attenuation ... charge packet on each ... is known as transfer ... and should be of the order ... for acceptable CCD ... devices. To ensure ... the case manufacturers ... on ion implanted ... channel beneath the ... semiconductor interface ... charge is transferred ... channel rather than ... interface and transfer ... ciencies as low as 10^{-5} ... recorded.

Although CCDs are ... ly analogue in operation ... digital applications it is ... sary only to distinguish ... the presence or absence ... charge packet. Since ... achieved with extremely ... amounts of charge ... 0.05 picocoulombs ... narrow CCD channel ... necessary. This results ... mely high data storage ... so that one of the main ... tions of CCDs is that ... digital memories.

Using an almost ... process, CCD ... achieve three- to ... improvement in the ... of RAMs with a ... reduction in the cost ... is partly because of ... size and partly because of ... simpler on-chip peripheral ... circuitry required with CCD ... memory chips. Since data rates ... are normally not more than 10 ... megabits/second, a surface channel ... device is usually preferred in ... memory application because of its ... greater charge handling capability.

The CCD memory component ... can be organised in a number of ... configurations; the choice ... depends on desired system performance.

There are important trade-offs involving clock frequency, number of phases, access times, overhead for peripheral ... and temperature range, ...

In any of the organisations the ... address is decoded from a number ... of individual memory blocks, ... each with its own amplifier for ... sensing and regeneration. The mean access time to ... any bit of data is proportional to the number of bits ... in the memory block.

In the synchronous or serpentine organisation, storage cells are ... laid out along a winding path ... with a signal refreshing stage at ... each corner. Each bit passes ... through every storage element ... in one trip through the device. Therefore, the internal shift ... frequency is equal to the I/O ... data rate.

For block lengths between 128 and 512 bits, this simple recirculating loop organisation is ... normally used, giving mean access times between 10 and 100 microseconds, depending on the ... clock rate.

In serial parallel serial (SPS) organisation, two single-channel serial shift registers of N bits ... and one large multichannel ... register consisting of M ... registers operating in step. ... A stream of bits is fed into the ... shift register at a high rate, ... transferred in parallel into ... the multichannel register and ... out through the other serial ... register. This arrangement accommodates more storage elements between refresh stages ... and both high data rate and ... lower dissipation because ... data bits are transferred at ... a lower clock frequency of ... the multichannel shift register.

Although additional slow ... clocks are required for the ... registers, this type of ... organisation offers the highest ... density that can be achieved ... in CCD memories. The most ... commonly used SPS block ... is 4K-bits, giving mean ... access times of about 0.5 ... ms with a data rate of ...

This type of organisation ... will make an impact on bulk ... memories, e.g. disc replacement. Currently Fairchild and Texas Instruments are producing 64K CCD with this organisation. Intel, Plessey, Toshiba and Bell Northern are working towards 64K or 256K CCD.

Although there are many applications for serial digital memories, two large areas are display storage and online disc replacement. In the former, the faster recirculating loop organisation is sometimes more suitable, when immediate access to any line of displayed data may be necessary.

The line addressable RAM (LARAM) organisation integrates CCD and MOS memory concepts to provide shorter access times and reduced capacitive drive requirements. It consists of an MOS address selection matrix and a number of CCD serial shift registers or lines. As the name implies, any line is randomly accessible but its contents are accessible in serial form.

Implementation of CCD components into practical memory systems is analogous to that of fixed head disc (FHD). The constant rotation of the disc is analogous to the constant shifting of bits in the shift registers.

An example of the sort of memory card that is available is the Plessey PSM5463 containing 64K-bytes on a double Eurocard (9" x 6") and operating at 4MHz, providing data rates of 64Mbits/s.

The basic recirculating block within, say, a 64K CCD component is 4K bits. Hence, it is necessary to assign the address space A0-A11 to correspond to individual bits within a 4K block. Since the system operates in a cyclic mode it poses no external refresh requirement. Standby power can be less than 1μW/bit. A 12-bit status counter monitors all types of data shifts — read, write and recirculate (standby mode). In order to make a read or a write access to the CCD memory system, block mode direct memory access (DMA) techniques have to be implemented.

Applications for CCD exist across the whole spectrum of digital systems. Principal areas currently being pursued by Plessey Memories are in TV scanning, where the inherent high data rate and relatively low power per bit of a CCD memory system is well suited to TV scanning/imaging applications.

This of course covers the general field of VDUs and terminals whereby medical electronics, geological surveys, astronomical surveys and a host of other diagnostic aids are making large demands for CCD memory to provide a means of CRT refresh. The storage requirement of an average system is of the order of 8 M bits.

The second major application category is the disc replacement market. The availability of 64K devices, the commitment of major US and Japanese companies to producing digital CCDs and the announcements of the incorporation of CCD bulk stores by several computer manufacturers, augur the rapid incorporation of CCDs for serial data processing.

The CCD memory system will immediately make an impact in providing a fast front-ended cache for disc-based systems. In applications where multiport facilities exist, the queueing and the eventual response times become objectionable.

In order to make CCD competitive with total disc replacement, considerable innovation in design and system implementation is desirable. The use of redundancy techniques at the chip level is one such approach.

Table 1 ... for different memory technologies in 1977

Technology	System cost/bit (cents) min	System cost/bit (cents) max	System access time min	System access time max	Units
Bipolar RAM	2	70	5	150	ns
MOS RAM	0.35	3.0	70	800	ns
Core	0.5	2.0	0.1	2	μs
CCD	0.01	0.35	0.03	0.15	ms
Magnetic bubble	0.01	0.5	0.2	10	ms
Fixed head disc	0.02	0.15	1	100	ms
Moving head disc	0.002	0.02	10	500	ms
Mass storage	<0.001	0.05	0.5	100	s

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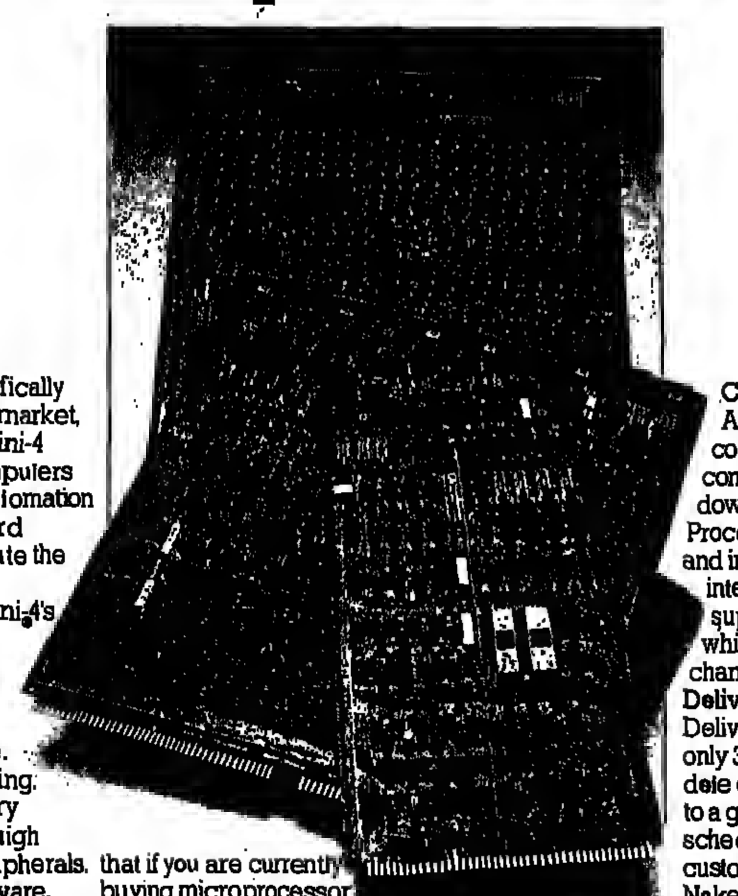

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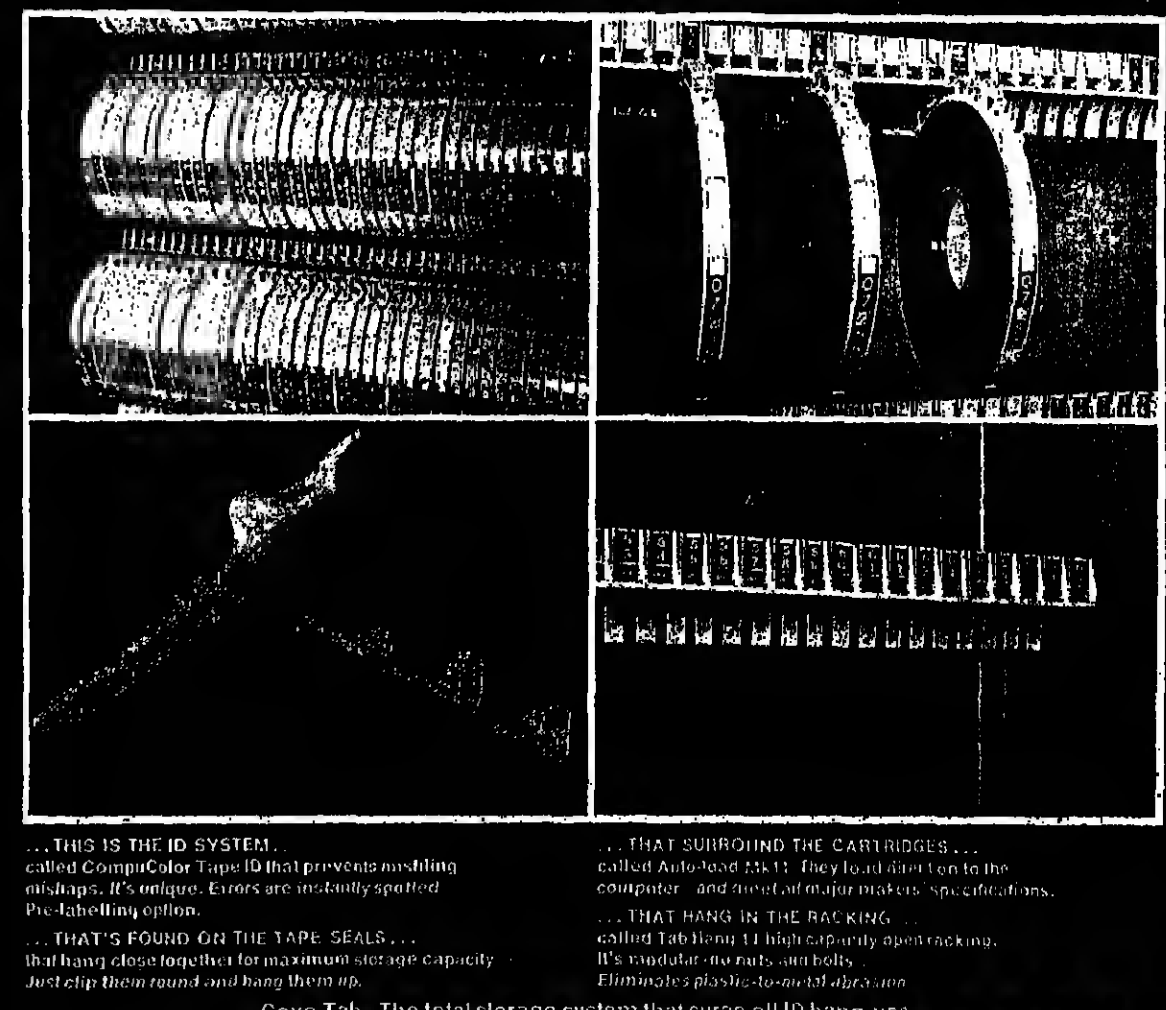

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Trends in medium capacity disc design

By Jerry Marshall

AS the demand for media storage grew in the data processing Industry the need for more speed became apparent both to design engineers and to users of data processing equipment. It was this search for apeed that led first from paper tape to magnetic tape and then on to magnetic disc memories.

The speed and reliability of the disc memory gives the user the key facilities of Immediate accessing and updating of data, allowing him to move from aimple record-keeping to online applicationa in business, accountancy, medical analysia, education and many other fields. The extra facility of allowing any number of users access to the same database became very Inexpensive aa the cost of mass storage went down.

High speed access and reliability gave the uaer his data immedistely and accurately. The access by many users to the same record enabled the atorage capacity to be kept to a minimum. As his demand grew the uaer could expand storage capacity as much aa he liked by adding new drives or converting his existing ones to higher danelty. As technology developed it became possible to pack data more tightly.

Switching from 100 TPI (tracks per Inch) to 200 TPI allowed the amount of information stored to be doubled; from six Megabytes to 12 from the same drive, for example.

Todey's new designa and technologies have given tha user a much greater atorage capacity for approximately the aame cost as hia old tape syatem.

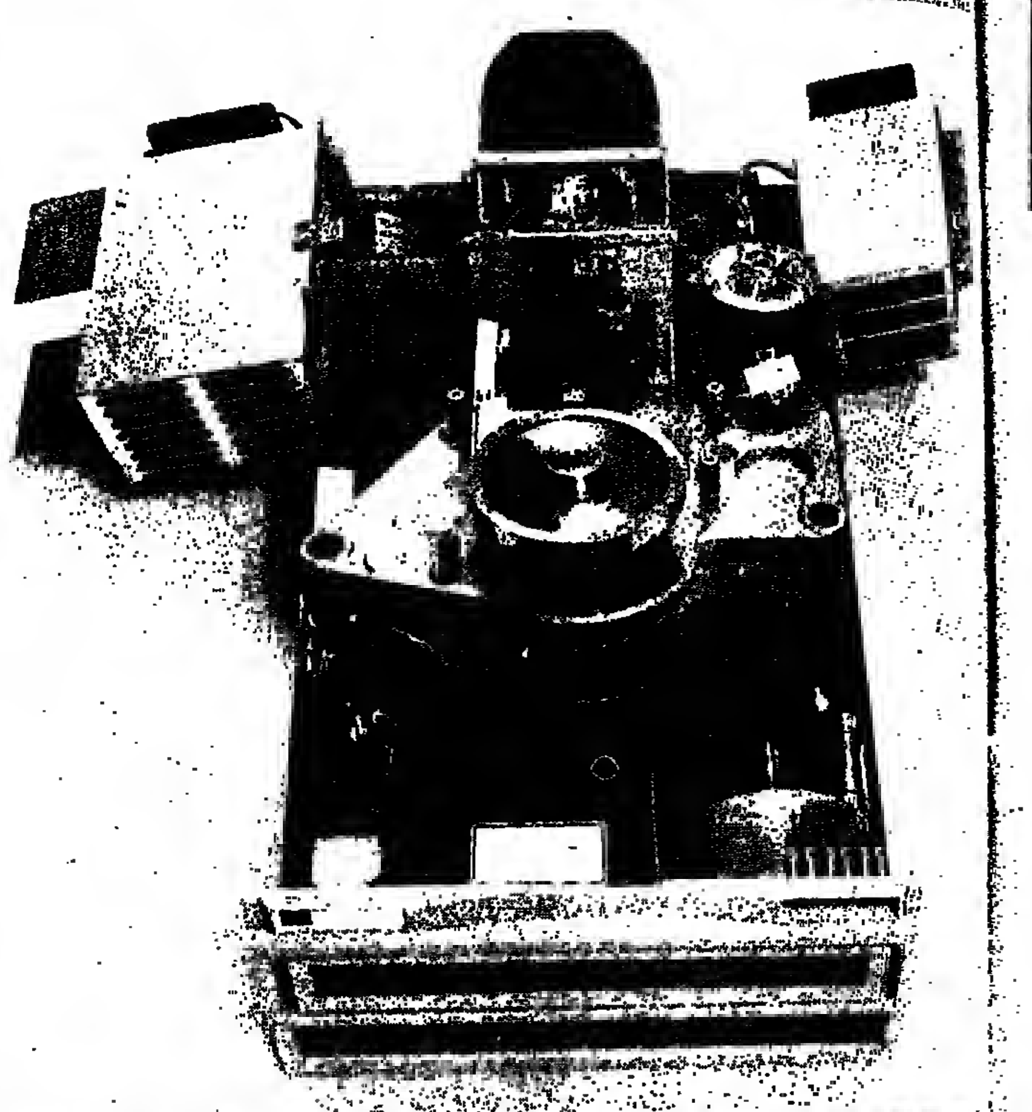
The amount of atorage he buys can now ba based on his present and future requirements — rather than on his budget.

The present market offera the customer a wide variety of drives and systema. He can choose from a number of manufacturers offering a complete line of disc storage from one kilobyte to 300 Megabytes, a range wide enough to ensure that his present and future needs are covered.

Disc drives today are sold in a buyer's market, and a competitive one at that. Inatead of buying all this equipment from a single computer manufacturer, the user now buys piece by piece wherever the price and tha apecification sult him best — although the larger manufacturers of CPUs and peripherals will naturally command a large portion of the market.

The middle of the disc drive market ia extremely competitive. Between three Megabytes end 100 Megabytes the number of manufacturers and their solutions to problems la almost unlimited. You can buy front-loads and top-loads, fixed and removeable; platters numbering from one to 10, with packing denalty from 100 TPI to almost 400 TPI, giving a wide range of storage cepacity from one kilobyte to 16 Megabytes on a single disc surface.

With the renewed popularity of fixed heads, maximum storage capacity of a single surfece has increased to almost 30 Megabytes. It is this very large increaae In data per platter which has caused the Industry to move from light mask technique to track following servo or embedded servo. Light maaks are still commonly used with drives of 3, 6, 10 and 12 Megabytes. But as more and more data Is packed Into a smaller space It becomes even more imperative that the positioning of the heads to the record be absolutely accurate.



Pictured above is the first of a range of high density disc drives designed for minicomputers and small ... from Telly. Nomed the Telly 80 80, it features automatic fault indication.

The track following aervo method makes use of a single surface of the disc with pre-recorded bits or dibits. Fed to a special head, they position the read/write head precisely over the data surface. The embedded servo method actually embeds the positioning information next to the data itself. Both systems have their proponents who argue that theirs is the better. But both are far faster than the old light mesk system. That gave a typical memory reference time of 12 milliseconda; track following servos cut access to around 5 milliseconds.

Recording methods vary, too — NRZI, DFM or MFM, atanding for non-raturn to zero, double frequency method and modified frequency method. The first two ere used with 3, 6, 10 and 12 Megabyte disc drives; the 25, 50, 75 and 100 drives use MFM, in which a variable frequency oscillator or variable crystal oscillator givea the customer the facility of data Input and output timed by the clock of the disc drive or the clock in his mainframe. This in turn makes it possible for more than one computar to access the same disc drive.

The trends in today'a market point heavily towards eaae of aervica and maintenonca. A customer Is no longer Impressed merely by the name of the aupplier. Equipment muat be easy to maintain and have a very high mean time between failurea.

Design engineers heva clearly takan these requiremanta to heart; average MTBF has almost doubled over the last two years. Tally'a new EMM 200 and 300, for example, hava minimum MTBF of 4,500 houra, yat routine maintenance ia confined to annual air filtar servicing and six monthly head-cleaning.

In choosing a disc drive, a disc sub-aystem or system, the systems house and the end-ueer must consider a number of thinga.

There muat be a big selection in the family of drives ha decidea on. Moat manufacturers' families ara lerge, with 3, 5, 8 and 10 Megabytes es the best sellers. Then as the customer's database grows he must have the ability to update to a larger capacity — or at least compatibility between drives to use existing softwere and if possible the same media.

Not surprisingly, today's end-users do not wnnt to be the first to try the latest technology. So the systems house must go first and prove to the user that a new product Is good enough to carry his name. It is not enough for the systems house to see a famous manufacturer's name; he has to look at the design — easc of access and a malntenence programme which can easily be handled by his service organiaation.

Todny the systems house may olso be looking at the buying of n cnmplete disc subsystem from the disc drive manufucturer, as well as the buying of discs for n subsystem he builds himself. He muat look at the contrnilers availoble to him nnd ot the cost of building his own interface, should ho not hnve o stondnrd CPU.

He must conaider the cust of tho disc drive, the interfocing ta his own systcm ond ony softwore chonges thnt must be madc. The coat of troining his own service ond saics personnol to mnintain o drive must be a factor In his decision. And the drive must be compatible with his existing ayatem and with the family In which he has chosen to live — and capable of being uprated or expanded to meet his future requirements.

The deaign engineer hos thought about theae and other problems and built in many of the answers. Disc drives are mora compact, mora aasily maintained and inexp... There are plenty of ma... facturers and plenty of ... — capacities from 3 ... Megabytes per single spin... example.

We have track following ... vos and embedded servos ... densities up to 370 TPI ... recording, error corr... facilities, and variable p... read/write heads al... access to marginal data.

Barring the appearance ... totally new method of ... memory storage with ... bulk comparable with th... modern disc drives, it is d... to see with present tech... how a further increase in ... packing density ca... achieved. But there are so... suppliers, and so much de... ment effort is being made ... would be surprising if the ... few years do not see prog... match the astonishing de... ments of the past two or ...

For medium and high ... disc drives, the independ... drive manufacturers are c... dent of keeping well ah... price-performance ratios ... by newer semiconductor ... natives — for the next fe... at least. The semicond... devices, such as CCD and ... netic bubble devices, are ... likely to have a short ... medium tarm effect on the ... capacity moving head ... drives and to a much l... extent on the ... head/removable part ... drives.

Jerry Marshall

Thenka to new technolo... gies, Installations requiring magnetic storage media can now buy them on the basis of present and future requirements, rather than ac... cording to budget.

Jerry Marshall, disc pro... ject manager (Europe) ... Tally, takes a look at today's marketplace. He discusses ... recording methods and ... points to some of the changes that have taken place during the ... years.

He says that the ... today's marketplace ... wards ease of ser... maintenance and ... that customers are ... impressed by the ... the supplier...

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Starting salaries may be above the minimum according to age and experience. A supplement of £313.20 per annum and a further supplement of between £130.60 and £208.80 per annum are payable in addition to salary. There is a non-contributory superannuation scheme and generous leave allowances.
The NERC is not a government department, but a government grant-aided body. Conditions of service are similar to those of the Civil Service.
For application forms, please write to
Mr. J. Hassford
Natural Environment Research Council
Falcon House, Fleming Way, Swindon, Wilts. SN1 2NG
Closing date for applications 24th October, 1977.

NATURAL ENVIRONMENT RESEARCH COUNCIL

EDUCATION DEPARTMENT
MONKWEARMOUTH COLLEGE OF FURTHER EDUCATION

LECTURER

COMPUTING AND DATA PROCESSING

GRADE I (£2913-£4869)

Applications are invited for the above post in the college's Department of Science and Technology.

Applicants should possess at least Part I Membership of the British Computer Society or equivalent qualifications. Previous teaching experience an advantage.

Application forms and further particulars available upon receipt of a stamped, addressed envelope from the Principals, Monkwearmouth College of Further Education, Swan Street, Sunderland, SR5 1EB.

Closing date for applications: 11th October, 1977.

L. A. BLOOM
Chief Executive

Borough of Sunderland

OPERATIONAL VACANCIES

SHIFT LEADER IBM DOS/VS, NW LONDON, £5,000 Incl.
SHIFT SUPERVISOR IBM OS/VS, CITY (mortgage sss), £4,500
SHIFT LEADER IBM OS VS, FELTHAM, £4,800
SNR OPERATOR IBM OS VS1, W1, £5,000
SHIFT LEADER ICL GII, HORSHAM (2 shifts), £4,000
OPERATOR, SIGMA, SLOUGH, £3,750
OPERATORS IBM DOS, BRACKNELL, £3,600
OPERATOR PDP/11, CITY (mortgage sss), £4,000
OPERATOR SYS/3, NW LONDON (mortgage sss), £3,750
OPERATORS RING TRICIA FOR FULL DETAILS

FREELANCE VACANCIES

IBM PL/1 OS, CITY, 3M+, £200 pw
IBM COBOL OS, LONDON, 2M+, £180
IBM PL/1 DOS, BUCKS, 2M+, £170
ICL FILETAB, 8EOS, 3M, £160
UNIVAC COBOL EXEC 8, W. LONDON, 6M, £190
BURROUGHS COBOL, CITY, 3M, £160
PDP/11 RSTS/ASS, BERKS, 2M+, £175
SIEMENS COMPILER DESIGN, GERMANY, 6M, £300

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GMC

Greater Manchester Council
TRANSPORTATION PLANNING GROUP

SENIOR ANALYST/PROGRAMMER

£3825/£5250 + £519 p.a. supplements

To have particular responsibility for supporting and implementing developments in the mathematical model which is extensively used in transportation planning. This model, which consists of a suite of programmes written in FORTRAN, is currently run on a CDC Cyber 72 machine via a RJE terminal located in County Hall. The G.M.C. IBM 360/50 is also used.
The feasibility of transferring the transportation model to a minicomputer is being assessed at present, and knowledge of such a machine would be an advantage.
Applicants should have a degree in a numerate discipline and have several years' experience of FORTRAN programming related to large models.

TRANSPORT MODELLER

£3388/£4892 + £498 p.a. supplements

This post is within a team currently engaged on the recalibration of the O.M.C. Transport Model (which has evolved from the former SELNEC model) using data collected throughout Greater Manchester in Autumn 1976.
Applicants should have a degree in a numerate subject and several years' experience in the development and use of mathematical models related to transportation planning: a thorough knowledge of FORTRAN
Conditions of service include removal, legal, etc., expenses up to £[illegible] lodging allowance, and flexible working hours.
Applications by letter giving full career and relevant personal details together with the names and addresses of two referees, to the County Personnel Officer, County Hall, Piccadilly Gardens, Manchester M60 3HP, by 14th October

NORTH-EAST THAMES REGIONAL HEALTH AUTHORITY

COMPUTER EVALUATION

The Regional Authority has a well-established Management Services Division providing a wide range of services to all levels of management, including O.R., Statistics, Work Study and Computing.
One significant element of the work programme is the evaluation of computer systems.
The work entails determining the benefits and costs of potential computer systems and measuring associated improvements in organisational performance and standards of health and patient care.
Applicants interested in this sphere of activity should be graduates in a numerate discipline with some knowledge of management services work. Experience in computer programming is also desirable.
Salary Scale £3522-£4408 p.a. (inclusive)
Application form and further particulars from Regional Personnel Officer, North East Thames Regional Health Authority, 40 Eastbourne Terrace, Paddington, London W2 3QR.
Telephone: 01-262 8011, Ext. 143, Ref. 182/CW/[illegible]
Closing date: 17th October, 1977.

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We are one of the world's largest manufacturers of household electrical products, professional electronics equipment and components which are distributed and sold into both the wholesale and retail markets in the UK and overseas.
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We have attractive career opportunities for experienced Analysts, Programmers and Technical DP Specialists through vacancies we need to fill, up to senior level in many areas of the UK.
We are looking for:

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Technical Programmers and Technical Specialists
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Senior Programmers
3-4 years experience as above with capacity to lead a team.

Systems Analysts and Senior Systems Analysts
With systems experience in industrial, distribution, commercial or accounting systems with potential to manage projects.

Technical Authors and Standardisation Specialists
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Write to: Fred Harrison, Philips Industries, 420-430 London Road, Croydon CR9 3QR.
or phone
ISA-UK Personnel Department on: 01-689 2166

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BASE 6K+QUOTA BONUS TO 8K+

Our client, a highly respected market leader in the bureaux systems field wish to recruit a sales professional, residing in the Bristol area, to assume total responsibility for the Bristol/South West sales function of the company.

OUR CLIENT OFFERS:
- ★ A reputation of being a major force in a bureau/sales market.
- ★ Recognised highly sophisticated hardware
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- ★ Dynamic expansion plans/superb career opportunities
- ★ Well above average earnings

CANDIDATES SHOULD:
- ★ Have proven track record in bureau sales or business systems markets, in a direct sales capacity
- ★ Have the ability to manage and motivate
- ★ Be mature and business-like approach to sales
- ★ Be aged 25 to 35
- ★ Reside in the Bristol area

The company's reputation, product line and growth plans are excellent and it is well established in a Bristol branch operation.

Interviews will be held in Bristol. Interested candidates should contact, without delay.

REG HEATH ON: 021-236 3781 REF. NO. 77/9/25

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ASSISTANT EDITOR

To work on Systems International, a monthly computer magazine with offices at Upper Norwood. The job entails technical writing using knowledge of computer science, electronics, systems analysis, design engineering, software, etc., with an opportunity to learn about publishing. In the first instance apply in writing to: The Editor, Systems International, 106 Church Road, London SE19 2UB. Tel: 01-771 3814.

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£150-£250 per week
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NEW SYSTEMS

DISTRIBUTED MULTI-PROCESSOR SYSTEMS

CMC's current development including its own intelligent terminal based system has created vacancies for systems programmers, technical support programmers, software evaluators and technical authors.

Staff are required to develop, support and provide services for truly innovative state-of-the-art distributed processing systems for use as on-line data base management information systems as well as data preparation systems. CMC's products require advanced telecommunication facilities to meet market needs.

Although not essential it is desirable for applicants for all posts to have experience in basic software for key-to-disk systems, telecommunications, intelligent terminals, operating systems, real time systems or compilers.

DEVELOPMENT PROGRAMMERS

Senior programmers and programmers are required to work on the exciting new distributed multi-processor system.

Our programmers are responsible for the design and implementation of all system software, including operating systems, telecommunications, language compilers and key-to-disk systems.

TECHNICAL SUPPORT

Our Central Support Team for Key Processing has a senior vacancy. The team is required to act as technical advisers and assistants to the sales force on pre- and post-sales. The job will involve advising on systems for prospective users, assisting the sales force on introduction of new products, trouble-shooting at problem sites, programming of demonstration packages and occasional work away from home for a few days at a time.

Applicants must have experience in high-level language programming (preferably BASIC or COBOL) in a commercial environment. They should also have a flair for solving problems and communicating with Sales and Customers.

A company car will be provided.

SOFTWARE EVALUATORS

The reliability of our software is an essential ingredient to the success of our products. Our certification team of evaluators provide the assurance of that reliability. Senior posts desirably require a wide programming experience in assembler and high-level languages but the qualities of being well-organised, thorough and responsible are essential.

TECHNICAL AUTHORS

Authors for high-quality user documentation ranging from operating guides and manuals to comprehensive Reference Manuals for system analysts and managers are required. Promotional literature and in-house support documentation add to the variety and interest of our authors' responsibilities.

A knowledge of Data Preparation or Mainframe operation would be desirable as would experience of writing on other computer based systems. Our authors have the responsibility for controlling all aspects of the production of documents from start to finish.

ALL POSTS

Competitive salaries are allied to the stimulus of working with small teams of experts in a lively working environment. These teams will, however, expect from applicants an expertise and enthusiasm to match their own.

An attractive salary commensurate with job demands as well as profit sharing bonus and company pension scheme are just some of the benefits of working at the headquarters of this close-knit European company.

Telephone Hemel Hempstead 61266, reverse the charges, and ask for Doris Cannon on extension 220 or Judy Batteridge on extension 208.

CMC Computer Machinery Company Limited
Maxted Close, Hemel Hempstead, Hertfordshire HP2 7LA
Telephone: 0442 61266. Telex: 825629. Cables: Compuco Hemel

Manager — Programming £7,000

Senior Programmer C £5,000
Programmers (3) C £4,000

Expanding Installation — N.W. London

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In DP the company is expanding both hardware and software. The present IBM 370/135 is likely to be replaced by a far more powerful machine. Recent extensions have been made to the present machine and Teleprocessing and Database software, with remote and shop floor terminal systems, is to be implemented.

Programming Manager C £7,000

Technical strengths and ability alone are not sufficient; the position requires a good man manager. Previous management or at least team leading or supervisory experience is required. The person appointed will be expected to be capable of formulating and implementing policy for the programming area including the investigation of new programming techniques and the definition of standards. Naturally a high level of technical expertise is also expected; the use of COBOL in a DOS/VS environment, familiarity with CICS/VS and DL/1 and preferably ability with other languages such as ASSEMBLER and PL/1.

Senior Programmer C £5,000

To be involved in programming design, difficult technical areas and the supervision, encouragement and training of more junior programmers. It is anticipated that in excess of 3 years' experience in a DOS or DOS/VS environment will be necessary. Preferably the successful applicants will have been involved with teleprocessing or database systems.

Programmers (3) C £4,000

At least 12 months' experience with COBOL, preferably on IBM 370 mainframes. Applicants will be expected to have the ability to absorb training in more complex techniques such as teleprocessing, database and structured programming.

The company offers competitive basic salaries, a bonus scheme, company pension scheme and other fringe benefits associated with a major organisation. There is a large car park and excellent public transport facilities. For further details write or telephone our CROYDON office quoting ref: CW56-7J.

01-686 9693 (24 HOUR ANSAPHONE) | 061 236 2419 FAULKNER HOUSE,
19, PARK STREET, CROYDON, CR9 1TN | FAULKNER STREET, MANCHESTER, M1 4YD

COMPUTER AND PROFESSIONAL PERSONNEL CONSULTANTS

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Computing Services Association

Manager- Computer Operations

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The company's computer operation uses a 96K IBM System 3 Model 15B disk/tape configuration with diskette input and line printer. The machine will be upgraded and on-line equipment introduced early in 1978. The location is at the company's UK headquarters in impressively modern offices at Hoddesdon, Hertfordshire.

A man or woman aged about 30 is required to take responsibility for all aspects of computer operations – mainframe, data control and data preparation. He or she will have had at least three years in a senior computer operations positions.

His or her track record will demonstrate the maturity and experience required to motivate a staff of 10 people, establish schedules, promote and maintain standards organise workflow and effectively liaise with both EDP development staff and user management. A knowledge of the IBM System 3/Model 15 would be an obvious advantage.

A salary of c. £5,500 is offered and company benefits include four weeks' holiday, free Life Assurance, contributory pension scheme and relocation expenses.

Please write or telephone for an application form and further details to the Personnel Manager.

MSD
MERCK SHARP DOHME
Merck Sharp & Dohme Limited,
Hertford Road, Hoddesdon, Herts. EN11 9BU.
Telephone: Hoddesdon 67272

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Aberdeen

British Airways Helicopters Limited have vacancies for four Flight Simulator Engineers and one Flight Simulator Engineering Officer at their Aberdeen base.

Duties will include maintenance, overhaul and development of an S61 Flight Simulator together with any additional helicopter simulators, link and procedure trainers acquired by the Company, plus all associated visual flight attachments used for pilot training.

Applicants, male or female, should have a recognised engineering apprenticeship or equivalent technical training to HNC (Electrical) standard, and be free to commence employment in the last week of December. Previous simulator experience is desirable.

Salaries for these permanent positions which are currently being re-negotiated, will be in the range £3885–£4911 p.a. plus applicable shift pay and there is a range of attractive fringe benefits including an inflation-proof pension scheme and holiday travel opportunities.

Please apply for an application form from: Jean Kosal, Personnel Assistant, British Airways Helicopters Ltd, Gatwick Airport, South, HORLEY, Surrey. Telephone: 01-668 4211 Ext. 3434.

British airways helicopters

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N.W. LONDON

Founded in 1478 Oxford University Press is one of the largest publishers in the U.K. with over 20,000 book and music titles in print. Applications cover all commercial aspects of book production, distribution and financial control, and text manipulation for computer typesetting. We use 1 12K ICL 1902T and five PTS 100 mini-computers. We make extensive use of VDUs operating on-line and off-line as batch telecommunication terminals, locally and remote from Oxford and Glasgow. We have VIDEMAC for interactive testing and source editing. The Systems and Programming Section is not large but is technically adventurous; staff roles need to be flexible and skills development is encouraged.

Senior Programmer

(Around £6,500)

This job needs a minimum of three years (ideally five) COBOL and some exposure to the 1900. Any experience of mini-computers, computer typesetting, real-time or telecommunications could be of particular interest.

Programmer

(£4,000-£5,000)

At least twelve months' experience of compiling and debugging programs in COBOL is necessary. Commencing salary for two/three years' experience will be around £4800.

In addition to usual benefits such as twenty days' holiday and pension/life assurance scheme, hours are on a flexitime basis, lunches are inexpensive and so are books. Smart office block, pleasant views and plenty of parking space; buses and Tubes nearby, and there is quick access to the M1, North Circular Road (and the Brent Cross Shopping Centre).

Telephone Systems and Programming Manager, John Everett, on 01-450 8080 for further details or write to The Personnel Manager, Oxford University Press, Press Road, London, NW10 0DD.

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salary £5000-£6000 + COMPANY CAR

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We seek to recruit a person with considerable experience in commercial applications. Pre-Sales work is an important part of the job — some experience of this, or plenty of enthusiasm, will be needed.

We provide a company car, pension, insurance and bonus scheme.

For the Job Specification, contact Andrew Reeves, Managing Director, 021-236 5234. (2 p.m.-7 p.m.)

We would like to apologise to our readers and Anglian D.P. Services Ltd., and East Anglian Systems Ltd. for any misunderstanding caused when in our issue of September 22 we produced the advertisement for East Anglian Systems Limited with the incorrect border artwork. We would like to state that in no way are the companies related.

INTERDATA

Due to rapid expansion, this internationally-known mini-computer manufacturer wishes to fill the following positions in the post-sales department:

- **SOFTWARE SPECIALISTS**
  to install and support the full range of operating systems, communication packages and languages for the Company's 16-bit and 32-bit equipment.
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  to work on certain large contracts which we have recently secured. The work will involve the control of all communication between INTERDATA and the clients, all technical liaison and, in certain cases, the support of special software packages developed by INTERDATA.

  The posts will be based at the Company's offices in Slough and will involve some travel in the UK and occasional visits to the USA.

One of the Technical Project Managers will also work for extended periods at the clients' sites in Europe.

The salaries for these posts will be around £6000 plus a Company car and the usual range of benefits.

We are particularly interested in hearing from people who have previously worked on INTERDATA equipment, nevertheless suitably qualified applicants will be considered.

Send CV, or write for details and application form to:

Dr. C.T. Morse, INTERDATA LIMITED

INTERDATA LIMITED
227 Bath Road Slough SL1 4AX
Telephone Slough 34511

EAST HAMPSHIRE
DISTRICT COUNCIL

ANALYST/ PROGRAMMER

£3,861-£4,214 inclusive

Applications are invited from persons with suitable experience in the area of system analysis and/or COBOL.

The present installation consists of a Honeywell 2020 with disks and tapes operating under Mod1 MSR. Assistance will be given in appropriate cases towards removal and disturbance expenses. *Housing accommodation may be* provided.

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Thames Polytechnic
Computer Centre

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Applications are invited for the post of Computer Operator from persons with at least five GCE 'O' level passes, or equivalent. Some knowledge of computer operations would be an advantage but training will be given to a suitable person. Commencing salary up to £3720 per annum inclusive.

Details and application form (to be returned by 11 October, 1977) from the Staffing Officer, Thames Polytechnic, Wellington Street, London, SE18 6PF (01-854 2030, Ext. 433).

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FIELD SUPPORT ENGINEERING MANAGER
c. 7,500 plus car

Applicants, aged up to 40, must be qualified electronics engineers with experience of managing the servicing and installing of computer equipment. A proven ability in managing personnel and effectively controlling and forecasting inventory is of prime importance.

Location — Thames Valley.

Please send full details, mentioning reference YN, to:

Executive Dynamics
23a High Street, Hemel Hempstead, Herts.

This vacancy is open to male and female applicants. All letters will be treated in strict confidence, and no details will be passed to our client without prior permission.

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Location: ESSEX **Salary: To £4800**

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(Male/Female)

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Nolton Communications Limited
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Applications will be welcomed from software designers, systems and applications programmers, with backgrounds in any of the following fields whether in main frame, mini or micro-computer environments.

Assembly level language programming **File processing** **Systems software**
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Applicants should be hardware designers with experience of development through to volume production in any of the following fields.

Fast random logic **Central Processors** **Micro/mini computer interfaces**
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The company is conveniently located in rural England with attractive housing costs.
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SURREY **to £5200**
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A strong background in the relevant commercial systems is required together with a knowledge of RPG II and or COBOL.

The right person will be able to demonstrate six years' computer experience, and the ability to communicate with top management is mandatory.

Salary is dependent on experience and all the usual benefits associated with a large group are available.

Please apply giving curriculum vitae to:

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Head of Management Services
Cope Allman International Ltd.
Lenton Lane, Lenton, Nottingham

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Please apply in writing to:
**Ray Whitlock
HOLT-SAUNDERS LTD., 1 St. Annes Road
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Tel. Eastbourne 638221**

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SIEMENS

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SIEMENS, eines der führenden Elektro-Unternehmen der Welt, arbeitet seit Jahren erfolgreich auf dem Gebiet der EDV mit dem System 7.000. Zur Sicherung und Erweiterung unserer internationalen Märkte erstellen wir komplexe Dv-Systeme zur Lösung betriebswirtschaftlicher und technischer Probleme.

Die Internationalisierung unserer Anwendersoftware erfordert, daß in enger Zusammenarbeit mit den deutschsprachigen Produkt- und Verfahrenskennern englische Manuale (User's Guide, Programmer's Guide) erstellt werden.

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- sehr gute Kenntnisse der deutschen Sprache
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  - Auftragsabwicklung/Rechnungswesen
  - technische Software (Bau- und Vermessungswesen, Computer Aided Design, Energieversorgung)
  - Planungs- und Operation Research-Software
  - Bank-/Versicherungswesen.
- Da die Arbeiten in enger Zusammenarbeit erfolgen, ist es notwendig, daß Sie bereit und in der Lage sind, innerhalb eines Teams Ihre Aufgaben wahrzunehmen.

Ihr Arbeitsplatz wird in München sein, einer Stadt mit angenehmem Klima im Alpenvorland gelegen.

Ihre Kurzbewerbung in deutscher Sprache erbitten wir unter Nummer HP 176 an die

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In addition we offer competitive salaries, a comprehensive benefit package and air fare to Canada for successful applicants and immediate dependents.

Preliminary interviews will be held in London throughout October. Applicants are invited to forward complete résumé in strict confidence to:

**Dept. 131, Government of Ontario,
Selective Placement Services,
Ontario House, 13 Charles II Street, London SW1Y 4QS.**

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Programmers up to £5,000
Senior Programmers up to £6,000

The European Development Group of DATA 100 is continuing its expansion plans to take on a significant portion of software development for the world wide market.

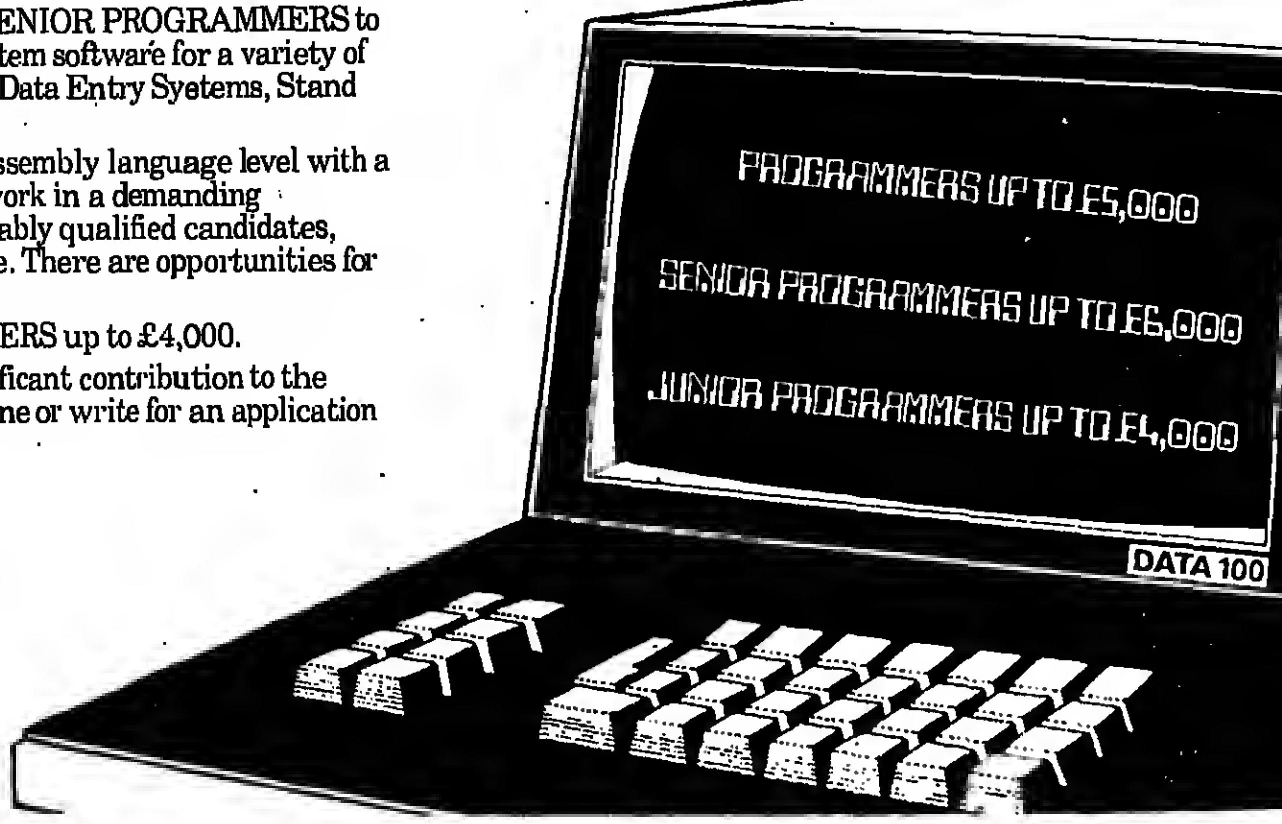
We are currently seeking PROGRAMMERS and SENIOR PROGRAMMERS to work in the development and product testing of system software for a variety of applications including On-Line File Management, Data Entry Systems, Stand Alone Processing and Remote Job Entry.

Candidates should preferably have experience at assembly language level with a mini, micro or VRC manufacturer and be keen to work in a demanding environment. Generous salaries will be paid to suitably qualified candidates, together with relocation benefits where appropriate. There are opportunities for travel to the U.S. and Europe.

We also have vacancies for JUNIOR PROGRAMMERS up to £4,000.

If you feel that you have the ability to make a significant contribution to the future development of this company, please telephone or write for an application form (quoting ref. EC9) to:

The Personnel Manager,
DATA 100 Ltd., Maxted Close,
Hemel Hempstead, Herts HP2 7LD.
Telephone Hemel Hempstead 61281.



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The work involves;

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Candidates must be:

—Male or female, preferably aged 25–35 with at least four years experience with large scale computer equipment and mini-computers; experienced in systems analysis, programming, project management and computer operations; preferably holding university degree. Although a professional accounting qualification is not essential, some experience and training in accounting is necessary.
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The assignments would be:

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School of Electrical Engineering

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Applications are invited from suitably qualified Electrical Engineers and Physicists for the posts of Research Assistants:

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The research is sponsored by Britain's leading manufacturer of audio recording heads and will contribute to an important export industry. The post demands high academic qualifications with industrial experience as a distinct advantage.

The successful candidate will continue existing work on computer simulation of magnetic recording processes.

COMPUTER ASSISTED LEARNING TECHNIQUES IN ELECTRICAL ENGINEERING EDUCATION

To design, implement and evaluate computer assisted learning packages for use in electrical engineering education and to investigate the application of computer assisted learning techniques within multi-media teaching and learning programmes. The project is part of the work of the Engineering Science Project of the National Development Programme in Computer Assisted Learning, and it will further extend the work of the School in this field. Candidates should be good honours graduates with interests in education.

Research Assistants are normally required to register for a higher degree, although post-doctoral applicants will be considered.

Appointments are for a period of two years with a possibility of a third year (fixed term contracts) and carry an initial salary of £2400 or £2721, dependent upon experience, with annual increments of £129. Supplements of £44 p.a. are also payable.

Research Assistants undertake six hours teaching weekly.

Application forms, to be returned by 11th November, 1977, can be obtained with further particulars from the Personnel Officer,

PLYMOUTH POLYTECHNIC, DRAKE CIRCUS, PLYMOUTH PL4 8AA

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senior programmer/analyst

£4,000+ and a car
Manchester

We are Lex Commercials Ltd., Britain's largest truck distributors with our Group Offices in Eccles and 20 locations across the U.K.

We are implementing a parts stock control system on the Lex Service Group Univac 90/30, involving some 20 RJE terminals. Subsequently, these will be upgraded to undertake stand-alone accounting and management information systems. We are now looking for a Senior Programmer/Analyst, male or female, to participate in all aspects of these developments.

The successful candidate will have COBOL programming experience, preferably on Univac equipment. Expertise in one or more of the following areas; analysis, RJE, mini-computer programming, stock control and accounting systems is desirable.

Career opportunities within the progressive Lex Group are excellent, and good fringe benefits include generous holidays, non contributory pension and sick pay schemes and re-location expenses where appropriate.

Write or phone for application form to Alan Gillies, Systems Manager, Lex Commercials Ltd., Charles House, Albert Street, Eccles, Manchester M30 0LL. Tel: 061-707 3990.

Lex Commercials

TRIAD Computing Systems Limited — Guildford

TRIAD continues to expand. Our London operation has been growing larger. We are now starting our first out-of-London operation in Guildford which will be managed by Dr. Keith McKenzie. We are therefore looking for high quality people to form a nucleus for this group. We also require more people to be based in our London office.

We have already made our name in minicomputer systems. We are also building up a solid business in microprocessor systems – hardware and software – primarily in industrial automation. Our European involvement is growing profitably. Less headline catching is our continuing work in commercial systems, mainframe program development, hardware selection and high level consultancy.

GUILDFORD

Early project work will include:

- database development
- text handling
- linguistic programming
- control and application software for mini and microcomputers

THE COMPANY

Continuing requirements include:

- commercial systems designers — up to £6,500
- experienced project leaders — up to £6,500
- competent programmers willing to exploit their talents in a structured environment — up to £4,500
- specialist consultants in appropriate areas — up to £7,000

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What we are offering is:

- challenging work
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- early responsibility
- bonus
- travel loans

Write, or ring: Erwin Schneider
TRIAD Computing Systems Limited, 1 Dorset Buildings, Salisbury Square, London EC4Y 8ES. 01-353 6323
Associated Operations in Belgium, France, Germany, Italy and Switzerland

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We have outstanding opportunities for Fortran Programmers, with a background in any of the following:

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It sometimes feels like the 'big two' are taking over. Especially when you're getting experience on another machine. Especially when the machine's fine, but the job isn't.
Datascene can help you. We've got vacancies on every machine you can think of, apart from IBM and ICL. And they're all good ones. Because we like to think that once we've found you a job, we won't see you again — for a long, long time.
Here are just a few of the vacancies on our lists. If you don't see one to suit you, give us a ring anyway.
TODAY!

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HONEYWELL	GCOS	C. LONDON	1 yr.	£3700
HONEYWELL	OS2000	HERTS	1 yr.	£3300
UNIVAC	EXEC 8	C. LONDON	1 yr.	£3600
UNIVAC	ANY	W. LONDON	1 yr.	£3500
BURROUGHS	MCPV	SURREY	1 yr.	£3600
NCR	ANY	C. LONDON	1 yr.	£3500
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We're looking for Analysts to work in a highly stimulating environment where personality matters almost as much as ability.
The company concerned runs an IBM 370/145 under O/S and are currently developing an IMS system.
They need people with at least one year's allied experience on medium to large IBM or ICL systems, with a good knowledge of COBOL or PL1. Database experience would be a considerable advantage, but is not essential.
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Middleweights who want to be Heavyweights.
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We have clients including software houses, consultancy users, retailers, bankers and insurance companies who are crying out for Programmers at all levels.
The emphasis is on IBM and ICL, but any hardware experience would be more than acceptable. This, plus between 6 months' to 2 years' experience of either COBOL, PL1 or RPG II will guarantee a first class move upwards.
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Exciting opportunity to spend 1-2 years in America with the technical staff of BLUE CROSS BLUE SHIELD. Relocation expenses and round-trip air fare paid.

We are the largest U.S. Health Insurance Organisation, and we have dual 370/168's with 450 on-line CRTs. We are involved in an array of sophisticated real-time applications, assuring you of excellent experience and training during your stay with us. We offer competitive salaries based on U.S. rates.

To schedule a confidential interview with our senior management, write immediately to our representative M. STARR, ROYAL LANCASTER HOTEL, LANCASTER TERRACE, LONDON W2 2TY, or telephone Mr. Starr at 01-262 6737 beginning October 3rd.

LONDON INTERVIEWS OCTOBER 10-13
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- need EXPERIENCED PROGRAMMERS who have the potential to train as systems analysts.
- are an expanding company producing defence systems for home and export markets.
- operate a dual IBM 370/158 environment with 70+ on-line terminals supported by IMS DB/DC.
- are committed to a 5-year programme of new on-line database system development.

We offer attractive salaries and conditions appropriate to a major company. Opportunities for advancement are excellent. Relocation assistance is available where appropriate.

For further information and an application form, please telephone or write to:—

You

- have 3-plus years' experience in IBM COBOL or Assembler programming, with a knowledge of OS JCL.
- want to extend your skills into systems analysis and design.
- are able to undergo intensive training in systems analysis/design, IMS techniques and presentations/report writing.
- have the maturity to deal objectively with user managers and their staff, and to put business problems into perspective.

FREEPOST,
Joe Jains,
Ref. C194A Personnel & Training Dept.
British Aircraft Corporation,
Guided Weapons Division
Stevenage, Herts. SG1 2DA.
Telephone Stevenage 2422, Ext. 2908

British Aircraft Corporation, a **BRITISH AEROSPACE** *company*

occ computer personnel limited

SCARAB COMPUTER SERVICES LTD

The Scarab Computer Services Bureau started life as a wholly owned subsidiary of the SGB Group of companies in March, 1977. The SGB Group, with a turnover of £70m, has decided to diversify into the fast expanding computer services business and to promote a profitable bureau operation whilst simultaneously meeting its own data processing needs. Several high calibre systems analysts and programmers are now required to develop a variety of commercial systems. Analysts and programmers work in closely knit teams from initial design through to implementation and support. There are good prospects for programmers either to move into systems analysis or into more senior technical positions.

Mitcham

New Bureau using B6700 with TP & DB applications

Project Leader Systems Analysts

£5,500-£7,000

Suitable candidates for these positions should have a minimum of 4 years' experience of commercial systems and preferably a programming background. Additional supervisory experience would be particularly relevant in order to fill the project leadership position and to justify the upper limit of the salary range.
Ref: 728A/CW

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Cobol on ANY hardware required

Programmers are required at various levels to work on a number of development projects. On-line development is used extensively as are data base techniques. Candidates should have at least 3 years' Cobol programming experience on any large mainframe. A knowledge of systems techniques and data base would be useful.
Ref: 7288/CW

These are unusual opportunities since they give candidates the chance to become involved in setting up a new venture, at the same time, offering the security of a sizeable and successful commercial group.

To apply for these positions, or for further information, please write or phone asking for Neville John. Day: 01-242 9356. Evenings: Farnborough, Kent (66) 52017. If you are interested but you are not sure if your experience is appropriate, please ring for an informal discussion or interview.
Interviews outside normal office hours can be arranged if more convenient.

Member of Computing Services Association

Computer Specialists

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Iran Air wishes to recruit systems and programming staff to join teams working on commercial and technical development in a data base environment. By the end of 1977 the configuration will include a dual 370/168 installation with 14 IBM 3340's and 180 display terminals. The work will provide challenge and opportunities.

The main requirements are:

Applications Programmers
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Senior Software Programmer
5 years in OS/Assembler & Teleprocessing

Computer Operator/ Project Supervisors
5 years' experience with at least 3 years' systems analysis.

Systems Analysts
2 years in commercial applications

Iran Air offers:
*Highly competitive tax free salary
*Good living conditions and excellent schools with free tuition for up to 4 children under 18 years of age.
*Airline travel privileges.

Please write with career and personal resume, contact address, telephone number and a recent photograph, specifying position applied for, to Mr. K. Daemi, Iran Air, 73 Piccadilly, London, W.1. Telephone: 01-491 3656.

Closing date: October 12.

IRAN AIR

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Please quote reference number.
Closing date for receipt of applications 30th September, 1977.

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New requirements are flooding in every day, so even if your experience is not covered above, we'll probably need you tomorrow.

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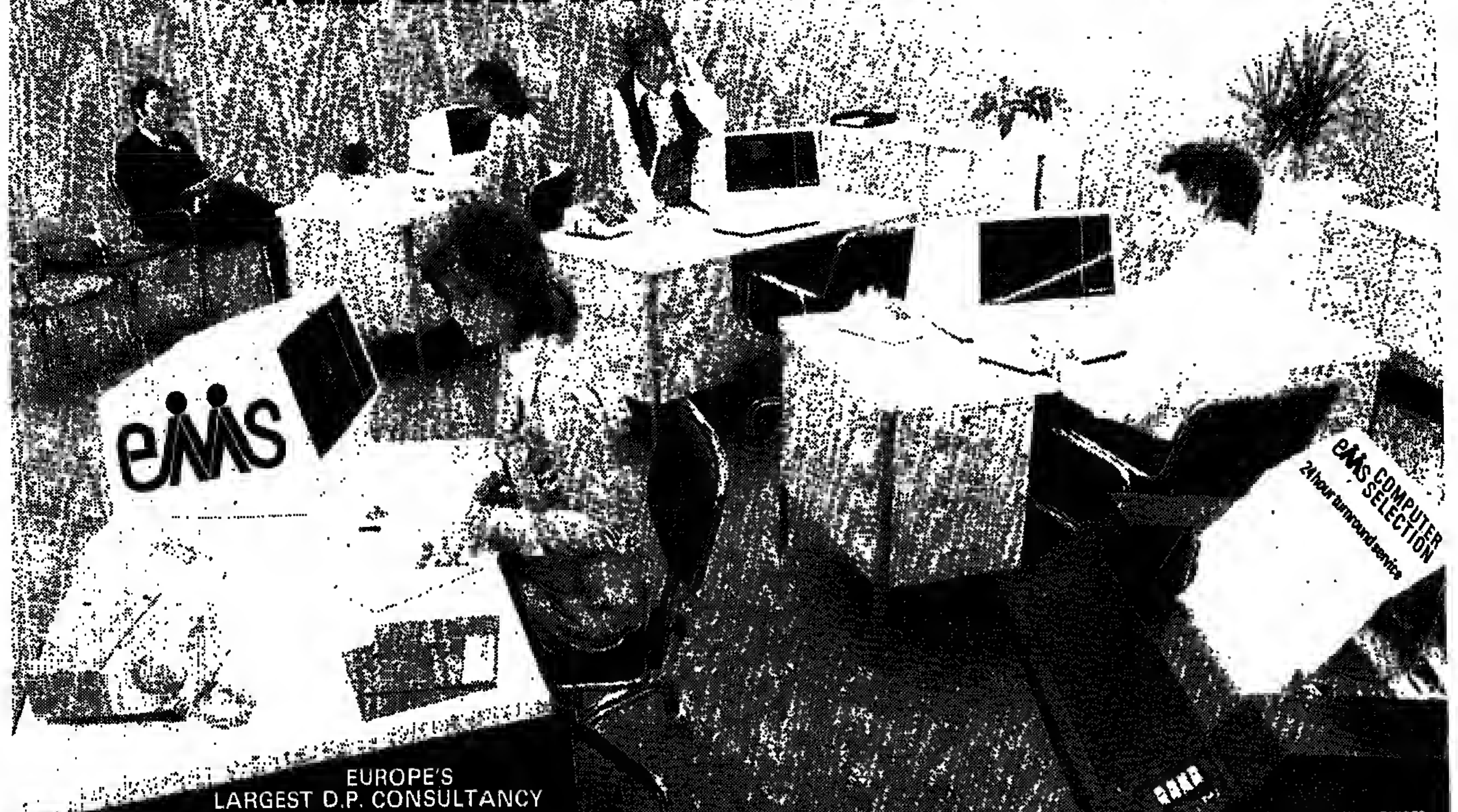

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Consultant: Denis Filby, Niall Bradley, John Wood.

ICL 1900 PROGRAMMERS
Preston To £5000

We urgently require COBOL Programmers for a bureau to work on a wider range of commercial applications including Accounting, Sales Order, Processing, Stock Recording, etc. Candidates with anything from 12 months' experience upwards, will be considered. Contact us urgently for interviews next week at the client site and forward the attached application form today.
Consultant: Selina Mills

ICL Analysts
Essex To £5000

Analysts must possess at least 1 year's ICL 1900 ... experience and have worked in a manufacturing and ... environment with a medium to large group. The group ... complex production scheduling problems, a wide variety of ... stock control development roles and large company ... Relocation assistance will be considered.
Consultant: John Wood

30+ COBOL PROGRAMMERS LIVERPOOL & MERSEYSIDE
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EMS urgently require a large, increasing quantity of COBOL Programmers to support existing consulting commitments within this region. Retraining to new hardware will be given where appropriate as will both specialist package and software training. We offer facilities to work in large installations handling such applications as Database Development, Financial and Stock Recording, Distribution Systems, Sales Order Processing, Accounting Ledgers, etc. Equally, excellent prospects exist for later regional travel. Relocation assistance provided where appropriate.
Consultant: Denis Filby.

Banking Analysts
Middlesex c£6000+

This represents an outstanding opportunity for soundly experienced banking Analysts to join a major international manufacturer, assisting with development of supporting business systems in a pre- or post-sales situation. We envisage the successful candidate being able to function with the minimum of supervision and maintain a professional, efficient image at all times, especially so when involved in direct client support roles. Futuristic banking systems developments are in hand, offering the successful candidate a unique experience of futuristic banking systems procedures.
Consultant: John Wood.

IBM Programmers
Derby To £4500

Our clients require a number of additional Programmers and Programmer/Analysts to work in small project teams split, each team 50% development, 50% maintenance. Projects generally are commercial batch work, Payroll, Accounts, Sales, Stores, etc. Language experience should be ASSEMBLER, COBOL or PL/1. Some on-line development is envisaged within the next 2 years.
Consultant: Selina Mills

ICL 1900 COBOL Programmers
West Country To £5000

A small Gloucestershire bureau has vacancies for ... Programmers to assist with developing client accounts ... will be given appropriate applications training where ... Opportunities exist for both Junior and Senior staff ... popular location with good middle term career prospects.
Consultant: John Wood.

Honeywell Team Leaders & Programmers
Essex To £6000

A major manufacturer has a series of additional group vacancies for a wide range of experienced COBOL Programmers and team leaders to join an expanding installation converting to a new large installation. Candidates should have experience of working in a manufacturing environment with sound experience of Stock/Production Control and Sales Order Processing. Any Honeywell experience gained to date, especially on Level 66, would be especially advantageous.
Consultant: Denis Filby.

PL/1 Analysts & Programmers
Midlands To £5500

A number of large IBM users have continuous requirements for staff experienced in industrial Process Control or Commercial applications. Ideally, Analysts should have at least 3 years' practical applications development experience and have worked on at least 1 major system with some degree of autonomy. A wide range of project work is available with opportunities to switch for manufacturing or processing bias to commercial development, or vice-versa if required. Equally, programmers should have at least 1 year's PL/1 experience and be seeking the opportunity of working in a large installation with multi-application projects to work on. Relocation assistance will be provided where appropriate.
Consultant: Don Walklate.

ICL 1900 COBOL/PLAN Programmers
North London To £5000

Our Clients, a major chemical producer, has urgent vacancies for ICL Programmers able to work on Stock Recording and Sales Order Processing projects. The company operates a U.K. network with thousands of individual accounts throughout the U.K. to be co-ordinated and monitored. Experienced staff of all levels are required. Any PLAN experience would be especially advantageous.
Consultant: Niall Bradley.

Programmer
Numerous U.K. To £5500

We currently have a wide variety of positions throughout the U.K. for experienced FORTRAN and ALGOL Programmers ... of vacancies include Operating Systems and Software Development ... behalf of leading computer manufacturers, Process Control ... suppliers and Defence Equipment Manufacturers ... simulation systems would be especially advantageous ... Interesting vacancies spread extensively throughout the ... including many leading companies in the Southern Home Counties.
Consultant: Niall Bradley.

2 ICL 1900 Junior Programmers
Birmingham £3650

Preference will be for ICL 1900 COBOL GEORGE 2 experience in a production environment, possibly having worked on Financial/Management Accounts. Programmers will write COBOL programs from formal specifications supplied by an Analyst, test and assist in systems user testing. They will work in a team environment developing financial systems incorporating Standard Costing, Sales Analysis.
Consultant: John Wood.

IBM Programmers North West London & Home Counties
To £5000

A leading food processing group require additional Programmers to work on continuous development and enhancement projects in the Northern Home Counties. Ideally staff will have at least 2 years' PL/1 experience with some CICS and perhaps Assembler. Excellent career opportunities exist for suitable young applicants seeking to gain top level experience with a large, sophisticated user.
Consultant: Don Walklate.

ICL New Range Analysts & Programmers UK
To £7000

A growing range of New Range purchasers urgently need experienced New Range staff to help them achieve early results and to assist work associated gain a clear understanding of the new equipment. Equally, a wide range of New Range development opportunities are available for staff interested in working either close to the West Country or in the North Midlands. With New Range experience, don't delay, complete the EMS application form and let us obtain results for you. EMS have the vacancies, you have the experience.
Consultants: Niall Bradley/Don Walklate.

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STAFFORDSHIRE, ST5 2RS
Telex: 36636

Management Services & Computing Division
Telephone: 0782 623665/6/7/8
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Company Ref. No.

SURNAME
Other Names
Address | Telephone Home | Bus | Ext
Post Code

Age	Date of Birth	Place of Birth	Nationality	Height	Weight

Married	Children	Car Owner	Driver	Nature of any Serious Illness

Position Required — Required Salary Range

Present Position — Salary

WHERE DO YOU WISH TO WORK

Within U.K.	Yes/No	Acceptable Areas	Abroad	Yes/No
Will you move	Yes/No		Europe	Yes/No
			Middle East	Yes/No

NUMBER OF YEARS EXPERIENCE

Operating	Programming	Systems Design	Systems Analysis	Management	Total

Available for Interviews
Available for Employment

DETAILS OF SECONDARY AND FURTHER EDUCATION

Schools	Date	Examinations Passed

College/University	Date	Examinations Passed

Business Courses with Dates

1. Present Employer — Town
Position — Date Joined

TYPE OF INSTALLATION

Commercial	Bureau	Insurance	Scientific
Manufacturing	Banking	Education	Engineering

HARDWARE	OPERATING SYSTEM	LANGUAGES

Software or Packages

On-Line	Real Time	Time Sharing	
R.J.E.	Tele Processing	Data Base	

APPLICATION AREAS YOU HAVE BEEN INVOLVED IN (Please Tick)

Cost Accounting	General Ledger	Manpower Planning	Personnel
Budgeting	Credit Control	Stock Control	Payroll
Forecasting	Order Processing	Production Control	O.R.
Corporate Planning	Marketing	Petrochemicals	Radar
Sales Ledger	Distribution	Linear Programming	Statistics
Purchase Ledger	Traffic Analysis	Simulation	

Projects Completed — Responsibilities

2. Previous Employer — Town
Position — Date Joined

TYPE OF INSTALLATION

Commercial	Bureau	Insurance	Scientific
Manufacturing	Banking	Education	Engineering

HARDWARE	OPERATING SYSTEM	LANGUAGES

Software or Packages

On-Line	Real Time	Time Sharing	
R.J.E.	Tele Processing	Data Base	

APPLICATION AREAS YOU HAVE BEEN INVOLVED IN

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Budgeting	Credit Control	Stock Control	Payroll
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Corporate Planning	Marketing	Petrochemicals	Radar
Sales Ledger	Distribution	Linear Programming	Statistics
Purchase Ledger	Traffic Analysis	Simulation	

Projects Completed — Responsibilities

Reason for Seeking Change

Details of type of position wanted

Additional Information –
Please explain below, in an 8-10 line precis, your current duties and applications experience

FOREIGN LANGUAGES

Spoken	Written	Read

Please show the number of years experience of the following. Where your experience is not specified please use the blank spaces.

HARDWARE	OPERATING SYSTEM	LANGUAGES	PACKAGES/SOFTWARE
IBM 360/370	DOS	COBOL	FILETAB
ICL 1900	OS	FORTRAN	DRIVER
ICL 2960/2970	MVT/MFT	ASSEMBLER	CICS
ICL 2903	GEORGE 1	PLAN	IMS
UNIVAC 1100	GEORGE 2	PL1	BOMP
UNIVAC other	GEORGE 3	RPG2	DBOMP
BURROUGHS 700/800	MCP	USERCODE	PERT
BURROUGHS other	Exec 8	AUTOCODE	VSAM
HONEYWELL 66	GCOS	EASYCODER	IOS/TOS
HONEYWELL 6000	OS 2000/200	ALGOL	MICROFILMING
HONEYWELL other	VMEB/VMEK	NEAT	TELEPROCESSING
NCR	J Level	CORAL	OMS
ICL System 4		DL1	
PDP			

3. Past Employer — Town
Position — Date Joined

TYPE OF INSTALLATION

Commercial	Bureau	Insurance	Scientific
Manufacturing	Banking	Education	Engineering

HARDWARE	OPERATING SYSTEM	LANGUAGES

Software or Packages

On-Line	Real Time	Time Sharing	
R.J.E.	Tele Processing	Data Base	

APPLICATION AREAS YOU HAVE BEEN INVOLVED IN

Cost Accounting	General Ledger	Manpower Planning	Personnel
Budgeting	Credit Control	Stock Control	Payroll
Forecasting	Order Processing	Production Control	O.R.
Corporate Planning	Marketing	Petrochemicals	Radar
Sales Ledger	Distribution	Linear Programming	Statistics
Purchase Ledger	Traffic Analysis	Simulation	

Projects Completed — Responsibilities

PLEASE CHECK THAT EACH SECTION HAS BEEN TICKED APPROPRIATELY
ADDITIONAL INFORMATION

General

Data Processing

Terminals

Software/Packages

Application Areas

Projects and Responsibilities

PENTA MANAGEMENT SERVICES LIMITED

P.M.S.L. GROUP

SOUTH OF LONDON

Urgently required IBM COBOL OS VS1 experienced programmers for leading insurance company. Salary circa 5K plus 5% mortgage. FPO1

CONTRACT

ICL COBOL/PLAN/Programmers, £150 plus. London and North-West. Long and medium length.

IBM COBOL and CICS, Yorks.

Contract operators required for our new operations division.

Rates from £100 per week, all machines, all areas.

CHESHIRE

New 2900 Series installation, analysts and programmer/analysts. All work is on new developments. Salary to 6K, plus relocation. CPRO1

FOR DETAILS OF THESE AND ALL OUR OTHER VACANCIES

PLEASE PHONE US ON 061-834 2003 daytime. Evenings up to 9.00 p.m., 061-740 3523

Two Senior Job Controllers

Kidsgrove, Staffs & Winsford, Cheshire

You will each be responsible for a small team of job control and operational staff, reporting to a Chief Job Controller who covers three different sites.

Your task is to control all the processing work of our internal data processing division at either our Kidsgrove or Winsford site. This is handled through 7503 remote job entry terminals linked directly to our large 1904S installation at Stevenage.

You will be involved in liaison with users, scheduling work on both a short and long term basis, preparing and initiating processing runs and controlling the output.

Kidsgrove is the centre of ICL's printed circuit design and manufacturing organisation. At Winsford we produce much of the Company's medium range computer hardware. Both locations are in the pleasant rural surroundings of the Cheshire Plain. Private housing is readily available at attractive prices and we'll help with relocation expenses where appropriate.

You'll already have several years' operational job control or systems experience, and will be looking for increased responsibility. Initiative, self-reliance and the ability to relate effectively with a wide range of ICL user departments are important aspects of these appointments. Salary is negotiable according to age and experience.

Please write or telephone, quoting reference CW1526, to Barry Kitson, Senior Personnel Officer, Corporate Systems, ICL, Wenlock Way, West Gorton, Manchester. Tel: 061-223 1301 ext. 2645.

International Computers

ICL

think computers–think ICL

CITY OF LONDON POLYTECHNIC

SENIOR COMPUTER OPERATOR

£3,391 - £4,064 plus £287 shift allowance plus 5% pay supplement £182 minimum — £208 maximum

The Computer Service at the City of London Polytechnic provides comprehensive computing facilities for ILEA Polytechnics, Schools and Colleges. Equipment installed currently consists of a large DEC System 10 computer with over 100 remote terminals, and two smaller Hewlett Packard Systems.

Applications are invited for a vacant post of Senior Computer Operator, to join a small operating team working on a two-shift basis. Preference will be given to applicants with operating experience on a DEC-10 and supervisory experience in a large multi-access installation.

For further details and an application form, please apply in writing to the **Assistant Secretary, City of London Polytechnic, 117/119 Houndsditch, London EC3A 7BU, by 10th October, 1977.**

CAPITAL APPTS.

FORTRAN Experienced and Trainee Programmers urgently required for industrial and scientific development

£3000-£6500

ALL AREAS

Phone for free list of vacancies

34, Percy St. London, W.1.

637 5557 day; 445 0468 eve

ANALYSTS AND PROGRAMMERS

WEST YORKS: PROGRAMMER/ANALYST £4,500 Due to Promotion. Vacancy for person with Cobol and/or RPG II. Small ICL installation with mainly financial applications.

SOUTH CHESHIRE: ANALYST to £5,000 Major ICL Database installation requires people for specialist applications. Superb in house training for applicants with real potential.

LONDON: PROGRAMMER/ANALYST £4,500 + Bonus Customer support function, general commercial applications. Good opportunity to widen your general applications experience on mini computers. Any language considered.

WEST YORKS: JUNIOR PROGRAMMER £3,600 Min 6 months experience Cobol. Opportunities for movement to Systems work. Medium size installation with good training facilities.

MANCHESTER: ANALYST to £6,000 Min of 2 years Systems experience on general commercial applications. ... class conditions of employment. High degree of user contact. Min H N C standard education.

WEST YORKS: PROGRAMMERS to £5,000 Large IBM installation with exciting new developments requires a number of people with good IBM Cobol experience. A knowledge of CICS/DATABASE/REAL TIME Systems will be additional advantages.

Interviews will be held in London, Manchester and Halifax.

Programmers and Programmer/Analysts: to £5,500 Hundreds of vacancies exist in the North and Midlands for experienced people with one or more language and good commercial applications.

To find your next career move, contact Chris Counney-Stone or David Fisher on 0422-58232

QRH COMPUTER RECRUITMENT

QUEENS ROAD MILLS, HALIFAX HX1 4LR

HALIFAX (0422) 58231 (10 lines)

Computer Programmer

c. £4,000 per annum

We are Britain's major footwear manufacturing and retailing organisation, employing some 20,000 people in shops and factories throughout the U.K.

We require an additional Programmer with 2/3 years experience, ideally of COBOL in an IBM environment. The Programmer should be able to supervise more junior Programmers, assist in programming design and specification work, carry out system testing and in some cases, take total responsibility for the programming of small projects.

Career prospects are excellent and conditions of employment are first-class, including a progressive salary structure that rewards performance.

Please write or telephone for an application form to the Personnel Officer.

British Shoe Corporation

SUNNINGDALE RD, LEICESTER LE3 1UR Tel (0533) 875682

PROGRAMMER c. £4,200

CROYDON

A person with about 2 years' experience of ICL 1900 PLAN or COBOL could find this position of interest.

SNR. SYSTEMS ANALYST c. £5,750

SYSTEMS ANALYSTS To £5,250

PROGRAMMERS To £4,700

N.W. SURREY

An International group with a firm commitment to DP expansion for the next five years, seeks the above staff. Development covers stock control, marketing and finance. The programming language is COBOL but programmers with any other language will be considered.

PROGRAMMERS To £4,500

AREAS: RUISLIP, HAYES, CRAWLEY, C. & N.W. LONDON

Please phone for an Application Form.

AMES PERSONNEL

TELEPHONE: 01-767 0611

Programmers

Farnborough, Hants — Up to £4,500

Thomson Yellow Pages Ltd, sole sales agents for advertisements in Post Office telephone directories, have two openings for experienced programmers in their systems development team.

Our computer is a 48k I.C.L. 1902S with discs and tapes using data input via V.D.U.s and cards.

Senior Programmer

Must have two years' experience, basically in COBOL, but some PLAN experience would be a distinct advantage.

Programmer

Should have 12 months' experience with either COBOL or PLAN but preferably both.

We can offer a wide range of attractive fringe benefits, together with excellent opportunities for career development.

For further information or an application form please apply to

Mrs. Celia Hands
Thomson Yellow Pages Ltd.
Thomson House
Farnborough
Hants
Tel: Farnborough 44391, Ext. 62

Cobol Programmer

A challenging role in a major bank

Up to £4,500 p.a.

The Banque Nationale de Paris Ltd., is the U.K. subsidiary of one of the world's leading international banks.

A recent internal promotion has now created the need for a COBOL Programmer with at least 18 months experience to join our DP section at Knightsbridge which currently operates an on-line, real time system based on Burroughs B3700 and B2800 processors linked to Burroughs TC500 terminals. We are also undertaking several new projects including a change to distributive processing using V.D.U.'s and involvement with computer to micro-film equipment.

The Programmer we need must be looking for real challenge and involvement and must have the ability to make an effective contribution as a member of a small, professional and dynamic team.

The starting salary will be up to £4,500 p.a. and will be negotiable according to your experience. Fringe benefits are extensive, as you would expect from a major international bank.

If you are interested, please telephone or write with brief details of your career to date to: Mrs. J. Ross, Recruitment Officer, Banque Nationale de Paris Ltd., Plantation House, 10-15 Mincing Lane, London EC3P 3ER.

Banque Nationale de Paris Limited

Plantation House, 10-15 Mincing Lane, London EC3P 3ER. Tel: 01-626 5678.

BNP

H.P.S.L. ... H.P.S.L.

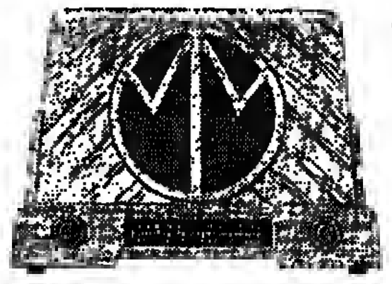
HERTS./BEDS. BORDER

PERMANENT

Please ring Joan Lovejoy Amersham (02403) 22201

ANALYSTS & PROGRAMMERS

We've come a long way since then.



Find out just how far, at our next informal interview.

Wondrous though the business seemed in 1922, when the BBC first began radio broadcasts, our industry was of course, in its infancy. But progress has been rapid. Today, we have a dynamic, technological and creative corporation, evidence of which can be viewed daily, in colour, on that complex piece of equipment in your living room. And as with many other contemporary operations, the computer has come to play a major role. With the BBC Computer Unit there are wide ranging applications in television, radio, engineering and finance, and now, we need more young analysts and programmers to help us develop new TP, on-line and data base systems for our ICL 2960.

You'd be working in Central or West London, but we'd like a chance to talk with you first, on one of the following evenings.

MONDAY, 3rd OCTOBER, between 5 pm-8 pm at GRAFTON HOUSE, 379 Euston Road, NW1 (by Great Portland Street tube station).

MONDAY, 10th OCTOBER, between 5 pm-8 pm at BBC Television Centre, Wood Lane, W12 (by White City tube station).

MONDAY, 17th OCTOBER, between 5 pm-8 pm at 88C, 252 Western Avenue, Acton, W3 (Gipsy Corner – nearest tube station North Acton).

We expect to meet young people of outstanding potential. And we can promise that you'll get a very clear picture of our career opportunities. (New salary increases are effective from 1st October 1977.)

If you can't make any of these dates, please write to:–

Appointments Department, BBC, Broadcasting House, London W1A 1AA quoting reference 77.G.497CW1, or phone 01-743 8000, ext. 4752.

BBC

Telecommunications Software Designer

Are you ready for a new challenge?

At STL, the advanced research centre of ITT, we develop software to control telephone exchanges—and software engineers work closely with hardware engineers in the design and implementation of these systems.

We now need an experienced Software Designer, a man or woman, to join one of the teams working in this field. Initially, you will be involved in the design, coding and testing of programs, but as your career progresses, you will be expected to use your software experience in *all* aspects of real-time systems control.

In terms of formal qualifications, you should have a degree or its equivalent in computer sciences or engineering. While experience in telecommunications or in process control software would obviously be an advantage, more important is your ability to assimilate new ideas quickly—and to apply them efficiently.

Salary will be very attractive, and there are all the benefits you would expect from an International organisation. These include generous relocation expenses.

Please write or phone for an application form, quoting Ref: 152/7B, to: Mr. V. Hartridge, Standard Telecommunication Laboratories Limited, London Road, Harlow, Essex CM17 9NA. Tel: Harlow 29531.

STL

HERTS., BEDS. & BUCKS.

ANALYST PROGRAMMER — to £6,500

With good Cobol and Assembler experience and potential to become the DP Manager for an installation dealing in market research and analysis applications. IBM or UNIVAC machine background essential.

OPERATION SUPERVISOR — to £4,500

To control all aspects of a small installation, including Data Prep Processing. Market Research and Analysis applications. IBM or UNIVAC operating experience essential.

SYSTEMS PROGRAMMERS — to £7,000

In-depth Assembler experience, preferably with knowledge of TP access methods, e.g. TCAM, CICS, etc.

VACANCY LIST

Free list of vacancies in Herts, Beds, Bucks and North London areas.

Contact Roy Brackenbury, St. Albans 61373

Blue Arrow Staff Bureau

Blue Arrow House, 3 Holywell Hill, St. Albans, Herts.

THE BOWATER CORPORATION LIMITED

Senior Computer Operator

c £3,500

A Senior Operator with at least 2 years' experience is required to carry out operations, job control and data control functions in a small installation.

Initially you will operate a medium speed RHE link to a bureau using UNIVAC 1108s but later may be trained to operate a large in house mini-computer.

Day work only is involved with occasional overtime. For further details please contact: The Personnel Manager, The Bowater Corporation, Bowater House, Knightsbridge, London SW1X 7LR. Telephone: 01-584 7070.

Thames Polytechnic

Computer Centre

Programmers

Applications are invited for two posts of programmer in the Computer Centre. Candidates should have a suitable degree or equivalent qualification and be experienced in at least one high level language. Previous experience in a similar environment is preferred.

Salary scale: £2786-£4288 inclusive.

Further particulars and form of application may be obtained from the Staffing Officer, Thames Polytechnic, Wellington Street, London, SE18 6PF, to whom completed applications should be returned by 11 October, 1977.

PROGRAMMER

IBM 360/50

Required to work on the Continent for up to one year and to join an existing team developing ATC simulation facilities. Must be proficient in programming in PL1 and Assembler languages. Working knowledge of a European language is also desirable. Salary from £4,000 per annum by negotiation plus expenses. In the region of £7,000-£7,500 per annum overseas allowance.

Please apply in writing to:

EWG Technivision Limited, 126-127 Promenade, Cheltenham, Glos.

H.P.S.L. ... H.P.S.L.

SOUTH HERTS.

PERMANENT

Please ring Joan Lovejoy Amersham (02403) 22201

William Key

LONDON PROGRAMMING CONSULTANTS Sound IBM experience — any languages	**to £7500** Ref: TA/126
LONDON CHIEF PROGRAMMER Good ICL COBOL and PLAN experience	**to £6000** Ref: TA/127
BERKSHIRE CONSULTANTS A.1 ICL experience	**to £8000** Ref: TA/128
CAMBRIDGE SYSTEMS ANALYSTS For IBM 370/OS installation	**to £5750** Ref: JG/129
LONDON SYSTEMS CONSULTANTS For Management Consultancy	**£6-£8K** Ref: JG/130
WEST LONDON COBOL PROGRAMMERS Various 370 installations	**to £5000** Ref: JG/131
N.&C. LONDON SYSTEMS ANALYSTS 2-3 years' commercial systems experience	**to £6500** Ref: CJ/132
LONDON & H. COUNTIES PROGS. & ANAL. PROGS. COBOL, PL1, ASSEMBLER or FORTRAN experience	**to £7000** Ref: CJ/133
HERTS, BUCKS, KENT SOFTWARE SPECIALISTS Software development experience	**to £7000** Ref: CJ/134
MANCHESTER ICL/IBM PROGRAMMERS Good commercial experience	**to £5000** Ref: ES/135
NORTH WEST SALESMAN Medium sized systems. Sales experience	**£5k+car+Comm** Ref: ES/136
M'CHESTER & L'POOL RPGII PROGRAMMERS Commercial applications	**c £4500** Ref: ES/137
COVENTRY SYSTEMS ANALYSTS Manufacturing experience	**to £7000** Ref: JDH/138
U.K. THEN HOLLAND SNR. TECHNICIAN Cargo handling or mini systems software specialists	**Neg.** Ref: JDH/139
LONDON BASED SALESMEN Products and/or time sharing services	**to £12,000** Ref: JDH/140

For full details of these and other vacancies please telephone or write to:

4 Half Moon Street, London W1Y 7RA, 01-493 2947

504/8 Corn Exchange, Corporation Street, Manchester M4 3DD, 061-834 2271

WILLIAM KEY & PARTNERS LTD

(24 hour answering services)

Experienced PL/1 Programmers

- ★ SALARY NEGOTIABLE UP TO £5,000
- ★ ANNUAL BONUS
- ★ LUNCHEON VOUCHERS
- ★ PENSION SCHEME
- ★ FREE LIFE ASSURANCE
- ★ STAFF RESTAURANT

The Applicant

We are seeking PL/1 Programmers with a minimum of 2 years' commercial application programming experience. Ideally you should possess a degree or its equivalent. Previous exposure to structured programming techniques would be advantageous, as would experience of on-line/real time systems.

The Job

The successful applicant will be principally working on an advanced statistical system using database techniques and on-line enquiry facilities as well as involvement in accounting/management information systems and technical insurance systems.

The Company

We are a leading firm of Lloyd's Insurance Brokers who have recently moved our Computer Department to new premises in Farnborough, Hants. Currently we are using RJE Terminals linked to two multiprocessing 370/158 operating under OS/VS2 and PL/1 is our main programming language.

In the first instance telephone:

Derek Banks—Computer Services Manager or Eileen Lawley—Chief Programmer on Farnborough (0252) 44484

or

write in confidence to:

Mrs. J. Fowler

LESLIE & GODWIN LTD.

Fleet House, Victoria Road

Farnborough, Hants. GU14 7NS

Leslie & Godwin Ltd

THE UNIVERSITY OF LANCASTER

COMPUTER SERVICES DEPARTMENT

PROGRAMMING INFORMATION OFFICER

The successful applicant, of either sex, will have experience in programming and will possess the ability to assist users from all departments at all levels in their use of computer resources, including remote computers in addition to the University's ICL 1906F. The job involves writing documentation, some lecturing, advisory work and programming.

A degree or equivalent qualification is required.

Salary Scale: Administrative: IB — £2904-£4671.

Further particulars may be obtained ... from the Establishment Officer, University House, Bailrigg, Lancaster LA1 4YW, to whom applications (six copies) naming three referees, should be sent not later than 21 October, 1977.

CAPITAL APPTS.

FORTRAN Experienced and Trainee Programmers urgently required for industrial and scientific development

£3000-£6500

ALL AREAS

Phone for free list of vacancies

34, Percy St. London, W.1.

637 5557 day; 445 0468 eve

COMPUTER PROGRAMMING TUTOR

£6000 - £7000

Applications are invited for the post of tutor to teach trainees to become effective programmers. The majority of programmes are to be written in the language of PL/1 for all IBM 370/168 installation.

Applicants should have experience in Commercial Data Processing and should possess suitable academic qualifications. Previous experience in teaching computer methods would be an advantage.

The successful candidate will be based at the Board's Computer Centre near the Elephant and Castle, but will also be required to work at other Board locations, including the Training Centre in Camden Town, NW1.

Applications giving details of relevant experience should be sent to the:

Personnel Director
LONDON ELECTRICITY BOARD
46 New Broad Street
London EC2M 1LS

LEB

Applications to be received no later than 13 October, 1977.

(The above post is open to male and female applicants.)

Senior Systems Analyst
Analyst/Programmer
Data Control Supervisor
Senior Systems Planner

Overseas opportunities for experienced graduates

You'll find more on-going projects and new systems development on Zambia's Copperbelt than you ever imagined. The two major mining companies there operate a wide range of computer-based information and control systems, and now seek applications from graduates (or equivalent) with at least two years relevant experience on IBM equipment for key positions in small working teams. A knowledge of PLI would be an advantage.

The Computer Centre is equipped with a 370/158 (2 MB) installation operating under VS2 rel. 1 78 with a wide range of peripheral equipment. Also MPSX – GPSS – FORESIGHT.

Benefits include tax-free passages to and from Zambia; low-cost furnished accommodation; tax-free children's education and travel allowances; generous paid leave; tax-free settling-in allowance. Employment is for an initial contract of 2 years. Salary will be between £5,200 and £8,200 a year (at present exchange rates) depending on age and experience, PLUS at least 25% of total salary tax-free at the end of your contract.

Our Repreeentetive from Zembie will be in our London Office between 9.00am-5.00pm on 3rd October - 7th October inclusive. Ring him on 01-628 3988 to discuss these jobs further or to make an appointment.

The Manager,
Zambia Appointments Division,
Zimco House,
129-139 Finsbury Pavement,
London EC2A 1NA.

RCM NCCM

PRODUCT DEVELOPMENT

Data Processing Communications

The Cable & Wireless Group, one of the leading telecommunications organisations in the world have a vacancy for a Product Development Co-ordinator in their Communication Systems and Services Department.

The man or woman appointed will work closely with the Product Planning Manager and senior management and will be involved in advising on product plans including development and market launch, providing detailed technical support and preparing original documentation.

Likely applicants will have completed HNC or a degree preferably in an engineering based subject and have at least 5 years experience of marketing in the data processing communications sector. The ability to communicate at all levels is essential.

The company offers a starting salary of £5,000 on a scale rising to £8,000 + and fringe benefits are those expected of a large organisation.

Application forms can be obtained from:-
The Recruitment Manager,
Cable & Wireless Ltd.,
Dept A, 891a/719,
Theobalds Road,
LONDON W1X 8RX
Telephone: 01-242 4433 Ext 4008

Cable & Wireless

O&M Officer
c. £5,000

Medishield Harlow, is a market leader in Life Support Systems and a member of the BOC International Group of Companies.

Due to internal promotion, we now urgently require an O & M Officer with a proven track record to join a small but effective Management Services Team deeply involved in both manual and computerised systems development.

The successful man or woman must have at least 3 years practical Work Study/O & M experience in an engineering based company with a solid grounding in PMTS and production methods.

In return we offer the above salary and the fringe benefits to be expected from a major international company.

For an application form please telephone or write to Joan Hunt, Personnel Department, Medishield Harlow, Elizabeth Way, Harlow, Essex CM19 5AB. Tel: Harlow (0279) 29692.

Medishield

1900 COBOL PROGRAMMERS
ON-LINE PROJECTS
CITY TO C£5,000
+Subsidised mortgage scheme

With on-line development using MAXIMOP in progress, our client — a major Insurance Group — is moving towards a new phase in their DP history.

Four major project areas are at the development stage, giving rise to a lively environment where project team members feel fully involved in each system.

This growth now creates prime opportunities for the following —

2 Programmers — with, from 18 months' to around 4 years' ICL 1900 COBOL experience.

Career opportunities are of the first order, especially for those wishing to increase their expertise in an on-line systems environment.

An excellent financial package includes mortgage facilities, non contributory pension and free lunches, whilst flexi-time is in operation.

Contact: LONDON OFFICE ON 01-935 0671 REF. 77/09/26

SPECIALIST COMPUTER RECRUITMENT LTD.
BIRMINGHAM 021-236 3781 FREEPOST
Freepost, Equity and Law House, 35-37 Great Charles Street Queensway, Birmingham B3 2BR
MANCHESTER 061-833 0676 FREEPOST
Freepost, Corn Exchange Buildings, Corporation Street, Manchester M4 8BD
LONDON 01-935 0671 FREEPOST 6
Freepost 6, 102, Blandford Street, London W1E 1JZ

Computing Services Association

SCR

Trainee Systems Analysts to £4,000

We have a number of vacancies for enthusiastic young people with a minimum of one year's sound programming experience to train in systems analysis.

The Company: We are a Computer Bureau offering services to both our parent organisation and external customers.

The Job: The work will involve assisting in the development of Real Time applications, custom built systems and package systems.

Career Plan: Formal training in systems analysis will be followed by specialist courses and on-the-job training under the supervision of our senior technical staff.

The Benefits: Our new purpose built computer centre is situated in pleasant rural surroundings near Halifax, West Yorkshire. We offer generous relocation expenses and excellent working conditions.

Please phone or write to Tina Black at:
Provident Management Services Limited
Colonnade, Sunbridge Road, Bradford, West Yorkshire BD1 2LQ.
Telephone Bradford 33321 Ext 231

Borough Treasurer's Department

SENIOR PROGRAMMER/ SYSTEMS ANALYST

Grade S.O.1 £5,044-£5,360 p.a. inc.

We need a person with 3-4 years' experience of programming in ICL 1900 COBOL, to join our Finance team using modular programming and GEORGE 2+.

The successful applicant should be able to supervise and monitor the progress of staff, and maintain effective liaison with our User departments, in the dual role of Senior Programmer/Systems Analyst.

Generous re-location expenses offered, in approved cases.

Application form from Personnel Officer, Town Hall, Forest Road, London E17 4JF (Tel. 01-531 8888 — 24-hour answering service in operation).

Closing date: 14th October, 1977. Please quote Ref. S.812.

London Borough of **Waltham Forest**

ON-LINE COMPUTER CONTROL
HARROGATE

The Control and Instrumentation Division of the Regional Scientific Services Department, located at Harrogate, requires a Research Officer (male or female) to join its team engaged in the application of real-time, on-line processing techniques, including data acquisition, analysis, display and control, to hierarchical and distributed computer control systems for power station plant. The work will involve investigation of the performance of power station plant and control systems, in order to improve present performance and to develop more advanced systems.

Applications are invited from candidates with practical experience in the application of modern control theory, techniques and computer equipment. Additional experience of the application to industrial plant processes in any of the following fields: plant modelling, modern electronics, analogue or digital on-line computation, or system commissioning, would be particularly useful.

Applicants should possess a good honours degree or its equivalent and be able to demonstrate initiative and enthusiasm for the application of current theory and advanced techniques to the solution of practical problems.

The salary for this post will be within a range of £5696 to £6400 per annum OR £6800 to £6950 per annum with possible progression to £7950 per annum subject to a review.

Point of entry will depend upon qualifications, experience and training.

Applications in writing, giving details of age, experience, qualifications, present employment and salary, should be forwarded to the Regional Personnel Manager, Control Electricity Generating Board, North Eastern Region, P.O. Box 177, Merlin Centre, Leeds LS1 1RL, to arrive not later than Friday 14 October 1977, quoting reference 6VN/867/CW.

North Eastern Region

Systems Design
Sheffield — To £5,500

Our client is a progressive medium sized engineering company based in Sheffield.

This is a challenging opportunity to design a new phase of real-time systems development.

The applications are management information systems in the Production and Accountancy areas. During initial development stages computer processing will be done on a local Honeywell 2060 and a remote Honeywell 66/20 using local terminals.

Candidates should have 2/3 years experience in systems design preferably in an industrial environment.

The salary is negotiable and relocation expenses are available where necessary.

Please contact Ken Harris
Professional and Executive Recruitment
Chesham House, Charter Row, SHEFFIELD
Tel. Sheffield (0742) 77558

PER PROFESSIONAL and EXECUTIVE RECRUITMENT
APPLICATIONS ARE WELCOME FROM BOTH MEN AND WOMEN

POTENTIAL PROJECT LEADERS

Are you ready to take responsibility for the analysis and design of major systems in the financial teleprocessing developments of our client in Norwich? If your proven experience includes similar development on IBM 370 hardware that's fine, but a good education plus the character and personality to communicate effectively with all levels of management are equally important.

Systems Analysts with equal abilities but less extensive experience on any hardware, also excellent opportunities to join the project teams now and progress to future leadership positions.

This client expects high qualities in its staff but equally offers high quality of employment in return.

Ring: Bryan Richmond, 0603 887233 at any time (or leave enephone message) or write: East Anglian Systems Ltd., P.O. Box 70, Norwich NR1 4EF.

Programmers

The Aviation Division of Smiths Industries Limited, a Leading International Company, has an expanding interest in the application of digital systems to the automatic control and management of gas turbine engines.

Vacancies have arisen for Programmers to work with the Software Group in support of these activities.

Candidates should have a degree in Computer Science, Mathematics, or Engineering, and should have had some experience in programming using assembly language.

Applicants for the above positions should have a minimum of two years' experience of one or more of the following:

REAL TIME SYSTEMS
DATA ACQUISITION
MULTIPROCESSOR SYSTEMS

Alternatively, evidence of capability in a similar environment may be taken into consideration.

Salaries are negotiable according to qualifications and experience. Generous re-location expenses will be available and other conditions of employment are those to be expected from a progressive company.

This post is open to applicants of both sexes.

For application form please write to:

Mr. S. C. Prestidge
Personnel Officer
SMITHS INDUSTRIES LIMITED
AVIATION DIVISION
Winchester Road
Basingstoke, Hants, or telephone Basingstoke 3191, ext. 242.

Wiltshire — £5,500

SYSTEMS ANALYST

Our client, the market leader in its particular field in consumer products, with a consistent and impressive record of growth, requires an experienced analyst to join its expanding Management Services Department.

The work will be on design and development of computer systems for a variety of important commercial projects. The company uses an ICL2970 and is highly dependent on computer based systems.

Candidates, aged from 25, should have had at least 2 years' systems experience, preferably with a programming background. Generous relocation expenses will be paid. Fringe benefits are excellent.

Brief but comprehensive details of career and salary to date, which will be treated in confidence, should be sent to:

J. G. Cameron, The Executive Selection Division-MW805
Coopers & Lybrand Associates Ltd., Management Consultants
Shalley House, Noble Street, London, EC2V 7DG

THE UNIVERSITY OF LIVERPOOL
Computer Laboratory

COMPUTER OPERATORS

Required to join a group of operators for ICL 1906S System running under GEORGE 4 operating system. Vacancies exist for both 3-shift and day shift work, and duties will include both mainframe and remote job entry terminal operations. Basic salary according to age and experience within the ranges:

Senior Operator: £2800-£3484
Operator: £2317-£3068
Trainee: £1712-£2317

Current shift allowance of 18% (under review) is paid for three shift working.

Application forms may be obtained from: The Registrar, The University of Liverpool, P.O. Box 147, Liverpool L69 3BX. Quote Ref. RV/86C/CW.

BRUNEL UNIVERSITY
COMPUTER SCIENCE DEPARTMENT

SENIOR PROGRAMMER

This post will involve developing software for the support of the teaching and research activities of a lively university department.

The successful candidate will be provided with an excellent opportunity to gain experience in the use of a variety of machines, including a CTL MOD 1, POP 8, ICL 1900, PRIME P300 and assorted microprocessors.

Applicants should be educated to at least 'A' level standard, O.N.C./H.N.C. or equivalent, and have a minimum of three years' relevant experience. A knowledge of CORAL 66, MODUS 4 operating system, ALGOL 68 and/or BCPL would be an advantage.

Salary within the scale £2858-£3631 plus £480 London Weighting.

Four weeks' annual leave, plus Christmas and Easter weeks. Good luncheon, sports and social facilities.

Write for application form to Assistant Secretary (Establishment), Brunel University, Uxbridge, Middlesex UB8 3PH, or telephone Uxbridge 37188, extension 48. Closing date 14 October, 1977.

City Treasurer's Department

Programmer

Post No. 549 — Salary Scale £3395-£4615 p.a.

Inclusive of Phase I and Phase II pay supplements

We are seeking a Programmer with more than two years' experience, preferably in BAL to join a small team of analysts and programmers working on a variety of applications. Some experience of systems programming and/or CICS would be an advantage.

The City Council operates an IBM 370/135 under OOS, and CICS in newly constructed Civic Offices with staff restaurant. Flexible working hours. Removal and resettlement expenses up to £500 will be payable in appropriate cases.

Application forms are available from the City Treasurer, Civic Offices, Guildhall Square, Portsmouth PO1 2AR. Closing date for applications is 10 October, 1977.

city of PORTSMOUTH

COBOL PROGRAMMERS
£150-£250 per week
SHORT OR LONG TERM
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Systems Analyst
COBOL
Design/Implementation
c. £8000 p.a.
Beds.
Phone 01-439 6481 (24 hours)
EFFECTIA GRAVIS
Personnel Consultants

HERTS AND NORTH LONDON

PROGRAMMERS — £3,500/£5,500
ANALYSTS — £4,000/£6,000

Haymarket Computing act as a DP recruitment consultancy to 35 companies in the Herts/North London area and we are currently anxious to interview Programmers and Analysts on behalf of clients located in **Cockfosters, Borehamwood, Edmonton, Barnet, Watford and Enfield.**

Applicants will be invited to look through our client register which details the companies, positions, salaries, prospects, etc., so that we may jointly decide which vacancies best suit your requirements and experience.

For an informal discussion ring:
HAYMARKET COMPUTING LTD.
Tel. Cuffley (Herts.) 4130
up to 7.00 p.m.

COMPUTER MANAGER
NORTH LONDON (N.18)
UP TO £4,000 p.a.

The job: to supervise a new mini computer installation consisting of a Nixdorf 8835 processor with console, one disc unit, line printer and 2 full time operators.

The person: ideally an ambitious young Operator or Programmer educated to at least 'A' level standard wishing to make their first move into computer management.

The company: a private company with approx 300 employees manufacturing a wide range of food products.

How to apply: Phone or write for application form to Mr. J. Ashby, Company Secretary, Rayner & Co. Ltd., Commercial Road, Edmonton, N.18. Tel. No. 01-807 3080.

Are you interested in a career in automation?
Contact:
HOLLAND SYSTEM HOUSE
Rijkestraatweg 19, De Meern, Holland
Currently we are looking for Experienced
COBOL PROGRAMMERS ANALYSTS
Fortran experience will be an advantage
Enclose a detailed CV

Royal County of BERKSHIRE

TECHNICAL COMPUTER PROGRAMMER

£2883-£4815

An experienced programmer is required to support a wide range of engineering design and technical information systems to work in a small group providing a computer service in the Surveyor's Department. The work includes writing, maintaining and giving advice on the use of computer programs to the department's road and bridge design engineers. Five interactive terminals, batch terminal and calcomp plotter are located in the department. The central computer is an ICL 2970 and carries a full range of peripheral equipment. Applicants should have a minimum of 2 years' experience in one or more of Fortran, Cobol or Algol. A degree or professional qualification is desirable, but the essential qualities of enthusiasm and practical approach will be given equal weighting.

Application forms are obtainable from the County Surveyor, Fifth Floor, Kennet House, 80/82 Kings Road, Reading RG1 3BP, or telephone Reading 58851, Ext 270. Closing date 17 October.

XOREN — BILTON HOUSE (East Wing)
54/58 Uxbridge Road
Ealing, London W5 2TL
Tel. 01-567 1725

We are a small software house specialising in mini computer systems and are currently looking for

REAL-TIME MINI SOFTWARE SPECIALISTS

£4,500-£8,000

Applicants should be able to demonstrate a good understanding of real time systems preferably with experience in such fields as communications, message switching and process control. They should also have a sound knowledge of at least one mini computer (experience on PDP 11s would be a particular advantage).

Computing Services Association

Please write to or telephone Mr. J. Jarvis giving details of experience

Senior O & M Analyst

Salary c.£6000 minimum

Mobil Oil Company Limited requires a Senior O & M Analyst to strengthen our Management Science Department in our London Head Office. Candidates, male or female, must be mature, able and experienced in identifying and quantifying general business systems problems, and in proposing positive and economically viable solutions in a variety of areas throughout the Company. Imagination, the ability to take a broad view of business affairs, an understanding of general management and organisational problems, and a wide knowledge of business equipment are held to be important attributes for the job. In addition, candidates must have experience in computer system development. The position requires the ability to [illegible] from inception to implementation and to ensure that the overall process of change is carried out in the user environment with the minimum of disruption.

Applicants should have a degree or equivalent professional qualification, with at least four years' practical experience of systems analysis/design — ideally as a project leader. This position offers a rewarding and challenging working environment, an attractive salary with many benefits, including pension and sickness schemes. Please write with details of age, qualifications, experience and present salary to:

P. J. Johnston,
Employment Adviser,
Mobil Oil Company Limited,
54/60 Victoria Street,
London SW1E 6QB.

Mobil

COMPUTER FACILITIES SUPERVISOR

HAYES **TO £4,500**

An interesting opportunity exists for an operator, shift leader or junior field service engineer with a strong sense of responsibility and good organisational ebility to move into e supervisory role.

Our Client's high technology product is internationally recognised as representing a break-through in medical computing. It is essential that the mini computers used to control this product receive optimum usage to enable the software department to run at peak efficiency and we thus wish to appoint e computer facilities supervisor to ensure a highly efficient end well disciplined day-to-day operation.

Responsibilities include liaison between the department and engineering functions involved in maintenance and repair, interfacing with the final test area, organising and administrating machine bookings, maintaining records and assessing end implementing improvements to procedures as necessary.

You will probably be in your early twenties with sound computer operational experience and the ability to keep accurate records of computer utilisation end produce graphs end figure work.

For further information, please contact the Advising Consultant quoting reference: CW/59.

HUTTON EXECUTIVE SELECTION LTD.
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HUTTON STREET, LONDON EC4Y 8HP.

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NATIONAL HOUSE
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LONDON W1V 3HP

FREELANCE PROGRAMMERS

All areas	c. £180 p.w.	ICL/IBM RPG
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Central London	c. £200 p.w.	IBM 370 PL/1
Surrey	c. £170 p.w.	Burroughs COBOL
Central London	c. £170 p.w.	PDP-11 MACRO-11
Sweden	ENEG	Honeywell H66 COBOL

For further details:
Telephone Les King up to 8 p.m. each evening or write to
Modem Computer Services Ltd FREEPOST London SW11 6BR 01-228 2283

MODEM
Computer Services Limited

TO £9,000 TAX FREE SAUDI ARABIA

with: ASSYST —consultancy
—software
—bureau service

ASSYST is the leading computer bureau and consultancy group of companies operating in Saudi Arabia and the Gulf. IBM computers are used commercially and scientifically at each datacentre — Riyadh and Al Khobar (Saudi Arabia), Dubai (U.A.E.) and the head office at Amsterdam.

The extent of the operation includes software development, standard package systems, systems consultancy, training and general bureau services. Staffing is multinational with English being the language in use.

To assist in the expansion of the group, ASSYST has the following vacancies in its Al Khobar branch

CHIEF OF OPERATIONS

to have responsibility for the computer department. At least 3 years' experience is required.

PROGRAMMER

who must have gained at least three years' experience with COBOL and RPG II.

Marital status for both vacancies is required to be bachelor.

BENEFITS. Both vacancies include free accommodation, medical insurance and car allowance. Vacation allowance two 3-week periods per year with paid air-fare.

Applications should be in writing with a c/v provided or by telephone/telex to: F. Storm, c/o ASSYST. 2 Laan van Kronenburg P.O. Box 500, Amstelveen, Neth. Tel. 020-645.34.82. Telex: 12280 bela. nl.

ASSYST
P.O. Box 155, Dhahran Airport
Saudi Arabia
Tel. 44020 — telex: 60028 ballast sj.

ASSYST
P.O. Box 6555
Riyadh, Saudi Arabia
Tel. 35823

Computer Services Centre
P.O. Box 1525
Dubai, United Arab Emirates
Tel. 29486 telex: 8306 csc ah.

Programming Professionals

New B6700 installation in Hampshire

ACT Services is part of a consortium representing five major British shipping companies and provides a wide range of specialist services connected with container shipping throughout the UK and Continent.

ACT Services is installing a Burroughs B6700 in early 1978 on which advanced applications concerned with all aspects of containerised shipping operations will be implemented.

This development has created opportunities for experienced programming staff at various levels within our Systems Development Department and applications are therefore invited from men or women with experience of either Burroughs or other large machines such as ICL 2900 and IBM 370 in any of the following areas.

—on-line and batch application development in COBOL
—database software
—systems programming (operating systems, data communications, etc.)

Attractive salaries, in line with the depth of experience being sought, will be offered together with generous relocation expenses where appropriate. Fringe benefits include luncheon vouchers, flexible working hours, 4 weeks' holiday, contributory pension scheme and personal sickness and accident scheme.

If you are interested in these opportunities which are based at our modern offices in Southampton please write to Personnel Department, ACT Services Limited, Richmond House, Terminus Terrace, Southampton SO9 1GG.

Alternatively you may telephone to discuss the positions on Southampton (0703) 3433 with I. O. Tomlinson, Systems Development Manager ext. 3387 or K.W. Wettern, Programming Manager ext. 3137 who will be available until 7.00 p.m. each evening during the week 3rd-7th October.

act
Associated Container Transportation Services Ltd

COBOL PROGRAMMER

Salary negotiable around £3,500 p.a.

This is an opportunity to join a young team with exciting growth potential.

Having recently advertised for an analyst and a programmer, we find that our increased development plans necessitate the addition of another programmer to our team.

We are embarking on a major development phase to supply computing facilities to newly acquired companies in our group. Areas covered will range from order/invoicing, stock control etc, to rather more esoteric applications such as structural stress analysis and heat loss modelling.

Our equipment comprises one of the largest I.B.M. System 3/150 installations in the country, with a strong commitment to developing our 3270 T.P. network. We require a programmer with at least 18 months' experience, who has the ability and ambition to widen his/her knowledge of computing and business in many diverse areas.

If you think you can play an important and contributory role in our development plans and want to be involved in a major development at its inception, write giving full details to:—

Personnel Manager, Kyle Stewart (Contractors) Ltd., Ardshiel House, Empire Way, Wembley, Middx. HA9 0NA, or telephone P. Campbell on 01-902 5321 Ext. 230.

KYLE STEWART

RPG II Programmer

We currently operate an IBM system 3/12, applications cover marketing, manufacturing and finance, on-line systems are now being developed. Applicants should have 1-2 years RPG II experience preferably on system 3. A knowledge of Somp and CCP is desirable but not essential as relevant training will be provided. Write or telephone for an application form.

Personnel Manager
BRITISH TWIN DISC LTD.
Knight Road, Strood
Rochester, Kent
Telephone:
Medway (0634) 77865

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Senior positions
c. £4600 p.a.
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(24 hours)
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UK AND INTERNATIONAL

£150-£400 per week

PROGRAMMERS

Ring Penny on 01-402 9355

The Performing Right Society Ltd.
(an association of composers, authors and publishers of music)
is looking for a

PROGRAMMING CONSULTANT

Salary around £8000
according to age and experience

Extensive PLAN and disc experience and also a working knowledge of ICL COBOL. The successful applicant will have successfully participated in at least one major system.

4 weeks' holiday p.a., 75p LV's per week, flexible hours, 35-hour week, but start and finish times are flexible, pension scheme, excellent mortgage assistance scheme after 2 years service.

Please telephone Personnel 01-580 5544 for write, giving qualifications and experience, to:

The Personnel Manager
Performing Right Society Ltd.
29-33 Berners Street, London W1.

Computer Personnel International

110 St. Martin's Lane, London WC2N 4BH
Telephone: 01-836 6775

PROFESSIONAL PROGRAMMERS

NORTH BUCKINGHAMSHIRE

Our Client is e well-established Software House with e diverse client base in the U.K. end Europe. They have offices in pleesent country surroundings very convenient to the M1 end due to expension they now need additional programmers with epprox. 2 years' experience.

Projects ere very veried and applicants should be versetile end keen to gain e wide renge of experience on minis end meinfremes. Some projects need to be completed on Clients' premises so e professionel attitude end willingness to travel is essentiel.

Saleries negotiable around £4,500

Contact JUDY GRAYDON

NEW SYSTEMS TEAM

WATFORD

The printing division of e well known International compeny is emberking on e new development programme end is seeking additionel stelf to join their smell friendly dete processing department. They ere setting up e new systems teem end heve en immediete requirement for the following:

SYSTEMS ANALYST C £4750

preferebly with 2 yeers' experience including the development of financial syetems. However, Programmers interested in moving into systems enelysis with experience on e lerge meinframe will elso be considered.

PROGRAMMER C £4000

with epprox. 18 monthe' programming on either IBM 360/370 or ICL system 4 end a sound knowledge of COBOL. Opportunities will be eveilable to join the systems team at a later stage.

To find out more about these opportunities
Contact LINDA BENSTED

SENIOR PROGRAMMER

NORTHOLT

to £6000

A lerge menufacturing compeny using IBM 370 under DOS/VS POWER/VS is commencing development on exciting new projects. Their plens include the implemantetion of Datebese end Teleprocessing and they heve a vecency for e Senior Programmer with practicel experience of IBM DOS COBOL. The person eppointed will report to the Chief Programmer end will be responsible for program suite and file design, programming project leadership end normel program development including writing program specifications.

For further information about
the company and position
Contact LINDA BENSTED

Real Time People — Computing Services Association — Computer Room People

Opportunities in New Zealand

DATABANK SYSTEMS LIMITED is the largest EDP user in Australia and New Zealand. The Company is owned by a consortium of the major banks and is recognised as the innovator in the banking industry. It has enhanced its computer facilities and is currently implementing a very important expansion programme, which has linked 12 centres through a national network of front end mini processors with local tele-processing facilities available at all points within the network. Two 370/165's II, four 370/145's, seven 360/40's, twenty-four mini computers, fast discs, audio response and user terminals make up an impressive system which puts Databank at the forefront of sophisticated computer developments in Australasia.

REWARDS:
- Top rates of pay for New Zealand conditions.
- Staff benefits. ● Air fares to Wellington.
- Assistance with accommodation in New Zealand.
- Reasonable excess air baggage allowance.

Initial interviews will be held in London in late September. Final interviews in London will be conducted by two Senior Managers from Databank during the four weeks commencing 17th October.

Please apply before 5th October, in strict confidence, preferably in writing, with a recent photograph, or telephone for an application form to Tony Fidler at:

Management Resources

MR
45 Conduit Street, London W1
Tel: 01-222 2022
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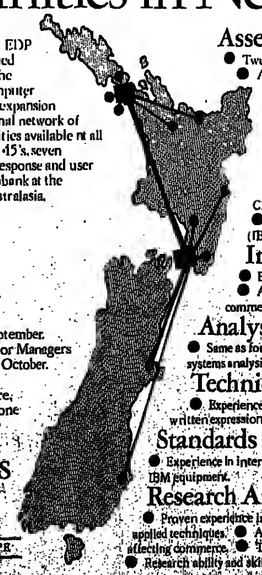

Assembler Programmers
- Two to three years' commercial programming in IBM Assembler.
- A good working knowledge of IBM OS/VS. ● Experience on IBM machines not less than 370/145. ● Willingness to do a share of maintenance programming.

Systems Programmers
Applicants to have some, and preferably all of the following:
- Commercial experience using IBM equipment for on line applications. ● A thorough knowledge of Assembler and Internals of IBM OS/VS and preferably MVS. ● A knowledge of IBM CICS/VS software, DBMS experience; and CPE experience.
- Experience in programming of mini computers used as front ends (IBM experience not essential).

Intermediate Programmers
- Experience in Cobol on medium to large IBM machines.
- A knowledge of Assembler. ● Two to three years' experience writing commercial applications.

Analyst/Programmers
- Same as for "Assembler Programmers" above plus commercial experience in systems analysis.

Technical Writer (Documentation)
- Experience in setting up a Documentation Section. ● A high standard of written expression.

Standards and Control
- Experience in internal EDP auditing. ● In depth commercial experience using IBM equipment.

Research Analyst
- Proven experience in advanced banking applications. ● A knowledge of computers and applied techniques. ● Ability to deal with medium and long term developments in and affecting commerce. ● The experience to examine the way the customers' needs are changing.
- Research ability and skill demonstrated by performance and a university degree.

COMPUTER PROFESSIONALS IN THE FOREFRONT OF BANKING SERVICES

The Co-operative Bank is a rapidly expanding member of the Clearing Banks, offering all the usual banking facilities plus the unique Handybank shopper service. Our recent rate of growth has brought us to a challenging stage of development in which major new DP systems and procedures will be introduced.

One of the most important of these will be a second-generation approach to a major national terminal network, containing elements of distributed processing in conjunction with IBM main-frames, and providing a customer service system at the fore-front of the banking field. The task of developing this system, and an associated enlarged financial/management accounting data base, offers some of the most stimulating computer opportunities in modern banking.

Co-operative Bank

DEVELOPMENT PLANNING OFFICER c.£7,000

A person with significant knowledge of hardware and software, who will conduct and co-ordinate strategic and tactical studies to determine the development of our computer and allied facilities, and their usage

Knowledge of other suppliers' products and a background in finance application is desirable. Experience in a similar role — with an appreciation of quantitative assessment methods — would be useful

SYSTEMS ANALYSTS £4,200~£5,500

Openings at up to senior level, to undertake the major analysis and design work related to the new customer service system and allied areas of application. Several years relevant systems experience is essential

SYSTEMS PROGRAMMERS £4,250~£5,000

Opportunities for people with several years experience of systems programming to broaden their scope, in software support for a developing IBM main-frame philosophy to be associated with a new network embracing distributed processing

Previous on-line network experience is essential and knowledge of IBM facilities desirable.

All these appointments are based at our Manchester Headquarters and the normal fringe benefits associated with a major banking organisation apply. Salaries quoted are starting figures, and are dependent upon age and previous experience.

Applications should be addressed to:
R. J. Gorvin, Personnel Manager, Co-operative Bank Limited.
Head Office, P O Box 101, New Century House, Manchester M60 4EP.

£8,000+ SENIOR PROGRAMMER Surrey
Our client is an IBM mainframe user also having mini equipment and looking for commercial programmers for user oriented applications using COBOL and ASSEMBLER languages. Experience of 370DOS will be preferred but others considered.

SENIOR OPERATOR
£4,000 + bonus + London, W.
One of the best employers requires a senior operator (shift working) for the ICL 1900 installation operating under S2. In addition to generous salary and bonus there are other valuable perks.

Many more unadvertised in our computer!

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CONTRACT UK

- High Income Contracts through R.T.Z. Computer Services
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R.T.Z. Computer Services Limited,
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RTZCS 01-930 4163

CONTRACTS IN NEW YORK

Four ANALYSTS & ANALYST PROGRAMMERS with large computer experience. Up to $500 p.w. for right people

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COLES CRANES

WE SEEK SYSTEMS AND PROGRAMMING PROFESSIONALS FOR EXPANDING AND PROGRESSIVE OPERATION

ANALYSTS, SENIOR ANALYSTS, PROGRAMMERS, SENIOR PROGRAMMERS

BACKGROUND

A record of continuous improvement is the keynote of this Group which has an unparalleled profit record spanning 40 years.
Our Engineering and Production reputation is highly respected in the industry, and so, in recent years, is its practical application of computer systems.
Existing systems, batch and T.P. based, include Engineering (DBOMP), RPS, Inventory Control, Finance and Parts.

THE COMPUTER

We currently use a 370/145 (1 mb), using 3330 drives, VDUs and terminal printers are used throughout the Company.
This is to be replaced in January, 1978, by a totally new configuration based on a 370/148 (2 mb).

METHOD OF WORK

You will be a member of one of our key project teams developing and implementing systems for Production, Purchasing and Corporate Finance.
All members of our project teams are encouraged to become involved with our user clients not only during requirements analysis but all stages of development.

CAREER PATH

This is a solid career opportunity offering experience, and training where relevant, in a wide range of systems in a dynamic business environment. There are excellent promotion prospects.

CANDIDATES

Applicants should have been involved in the successful implementation of at least one major project, ideally utilising one or more of the following:—

DL/1 ASSEMBLER
DBOMP PL/1
CICS/VS

In the event that you have not been involved with any of the above yet have **SOUND ANALYSIS EXPERIENCE** or have programmed in **COBOL** we are still interested.
Salaries are highly competitive, relocation expenses are available where applicable. Working location is in Sunderland, easily accessible from Durham, Newcastle, Chester-le-Street and Washington New Town. The area has some of the best countryside and coastline in England.

APPLY NOW

by writing in sufficient detail as to make an application form unnecessary to:—
PERSONNEL MANAGER
COLES CRANES LTD.
SUNDERLAND SR4 STT

Or telephone Roy Smith (0783) 56281, extension 326, to discuss details and arrange an early interview.

A Division of ACROW

REWARD!

In the current climate, we believe that reward and recognition are vitally important parts of the motivation of our staff. Add to this, involvement in development projects over a wide variety of applications, environments and challenges. Complement that with the utilisation of people's experience and skills, combined with the development of new skills and the broadening of each individual's spectrum of ability.

Put all this within the context of a truly professional D.P. Company, and you're beginning to get a picture of Mouncey and Partners.

Currently we are looking for the following personnel.

PROGRAMMERS

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The above salaries are only an indication of possible starting levels of salaries, and therefore could be considerably higher dependent upon your experience and background.

IBM COBOL and/or ASSEMBLER under OS
ICL COBOL and RPG II particularly on 2903 range
HONEYWELL COBOL under OS 2000
UNIVAC 9030 and 1100 range

Ring 01-903 4901 and talk to either Mel Bixley (Director) or John Birch (Head of Development)

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PRODUCT NOTES

Fitments for housing DP materials

TWO fitments for housing computer materials have been produced by Roneo Vickers' furniture and systems division to fit their latest range of system storage containers.

A lateral filing frame has been developed which will hold up to 30 binders of an average 2 inch thickness. The binders will house print-outs and all the most commonly used sizes of continuous stationery.

The second fitment is a rack designed for storing magnetic tapes. It will house all standard tape sizes and each rack can take up to 20 reels. Each reel is held firmly in the rack and is released by gently pushing it to the rear of the cabinet.

Both fitments are designed for any of the 915mm (36 inch) wide system storage containers in the range. These, styled in a mixture coffee and cream, are available in four heights. Each container can be equipped with a variety of closures and standard storage fitments, according to need.

For storing computer materials, a container may be devoted entirely to lateral filing units, computer tape racks or a combination of the two.

Roneo Vickers Ltd (CW), Roneo House, Lansdown Road, Croydon, CR9 2HA. Tel: 01-686 4321.

Patch

FROM the Spectron Corp is a patch unit that enables an RS-232 interface to be intercepted and transferred to any other interface connected to another patch unit. This is executed via a patching cable.

Spectron Corp (CW), Church Road, Mount Laurel, New Jersey, USA, 08057. Tel: (609) 234

A MINIATURE and portable terminal designed especially for text editing applications such as journalist systems has been announced by Informer.

The display terminal, which weighs just 22 kg, allows the deletion and correction of characters, lines, sentences and paragraphs. A scroll control enables the user to run through the whole text, forwards and backwards, until it is correct.

The terminal has a 6K bytes memory. Four terminals can be linked to a single control unit.

Informer Inc. (CW), 1 Nursery Close, Amersham, Buckinghamshire, HP7 9AS. Tel: 02403-4122.

Cosy 200 for news office

A COMPLETE DP system for newspaper and journal production now offered by Siemens is based on a software package called COSY 200. This handles text input and editing by the editor, compositor or proof reader and phototypesetting.

With COSY 200, the user can input text locally or remotely via a terminal such as the Siemens Transdata 8162 display — with its text editing functions — or via magnetic tape or paper tape.

The COSY 200 enables copies of the text at different stages of editing to be stored and accessed using an index. Three lines of any one text can be displayed while looking through the index.

Typesetting functions can be programmed under COSY 200 using COSY 100, a language providing typographical instructions. Functions can include straight text matter or mixed composition, advertising composition with automatic height justification, composition of tabular matter with horizontal and vertical rules, single or multi column make up and bookwork make up with running head or folio.

Siemens Aktiengesellschaft (CW), Zentralle für Information, Pressesabteilung, 8,000 Munchen 1, Postfach 103, West Germany.

Regulator

INTRODUCING a 475 watt multiple output switching regulator power supply unit into the UK is Trio Laboratories.

It provides three or four output switching regulator power supplies with integral forced air cooling up to 475 watts in a unit measuring 127×203×364mm.

It is fully rated up to 55°C ambient temperature. Various combinations of output voltages and ruggedised versions for military environments are available on request.

Trio Laboratories Ltd (CW), Grove House, Grayshott, Hindhead, Surrey, GU26 6LE. Tel: Hindhead (042 783) 6060.

Double density recording on disc

A FLEXIBLE disc drive claimed to be the first to offer double density recording on a 5¼ inch diskette has been introduced by Pertec International of Reading.

Called the FD200 Microfloppy, the drive can record up to 250K bytes on each side of a 5¼ inch diskette. According to Pertec it is mechanically and functionally interchangeable with the 5¼ inch SA400 Minifloppy drive from Shugart Associates but permits writing on 40 tracks versus the 35 track limit on the SA400.

The inside track recording density of the FD200 is 2581 bits per inch and the formatted capacity of the drive is 102,400 bytes per side. Other performance figures include a data transfer rate of 125,000 bits per second and an average access time of 463 milliseconds.

The read/write head is IBM compatible with a life estimated at 20,000 hours and Pertec points out that a special design feature prevents the head from disengaging from the positioning cam mechanism.

The FD200 interface electronics are held on a single PC board and up to four FD200 drives can be "daisy chained" on a single 34-line ribbon cable.

According to Pertec the FD200 signal interface connector and the DC power connector are compatible with the Shugart SA400 and the mounting holes and outline dimensions are the same.

The FD200 measures 5¼ x 3¼ x 8 inches, conforms to ECMA standards and is competitive with the Philips or 3M minicassette tape drives.

Pertec International (CW), 10 Portman Road, Reading, Berkshire. Tel: (0734) 582115.

Short distance modem

A low cost modem designed for short distance communications has been introduced by Modular Technology. Called the Interdriver LD 96A it can handle transmission speeds of 9,600 bits per second over distances up to 10 kilometres (six miles) and at 110 bps for up to 20 kilometres (12½ miles).

The LD96A can handle full and half duplex asynchronous and synchronous transmission over DC continuous unloaded lines and comes with a standard interface. It costs about £140.

Modular Technology Ltd (CW), PO Box 117, Watford, WD1 4PD. Tel: 01-421 0626.

Modem

THE modem range manufactured in the US by the Penril Corp of Rockville, Maryland, is now being marketed in 21 European countries by Redifon Telecommunications under an exclusive agreement.

Penril products available now from Redifon include short haul modems and the Penril 4800/9600 Micro modems. Notable features of the latter include high-speed multi point polling and out of band diagnostics.

Redifon Telecommunications Ltd (CW), Broomhill Road, Wandsworth, London, SW18 4JQ. Tel: 01-874 7281.

1978 Sasco Year Planner

THE 1978 edition of the Sasco Year Planner is now available. Like its 16 predecessors the wall chart has a plastic laminated brown and beige surface measuring three feet by two feet.

The whole year is set out in days, weeks and months and forward planning can be highlighted by self-adhesive symbols and tapes in a variety of colours.

Other details can be written in either on the symbols or on the chart itself. The planner costs £4.95 mounted or £2.85 unmounted, including symbols. It is available from stationers and other Sasco stockists.

Sasco Ltd, Sasco House, 27 Hastings Road, Bromley, Kent. Tel: 01-462 2241.

Puzzle answer

LET n equal number of bricks in a wall. This means that Bill lays n/9 bricks per hour when working on his own, and Fred n/10 bricks per hour. Ten fewer bricks an hour get laid when the two men work together, so the combined production rate is $n/9 + n/10 - 10$ bricks per hour. Multiplying this rate x 5 will give the total number of bricks in a wall — ie, $5\,(n/9 + n/10 - 10)$ equals n, which makes n 900.